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Green's Apple* Magazine

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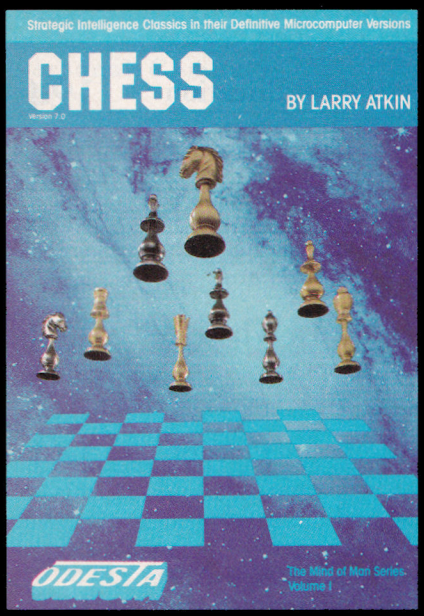
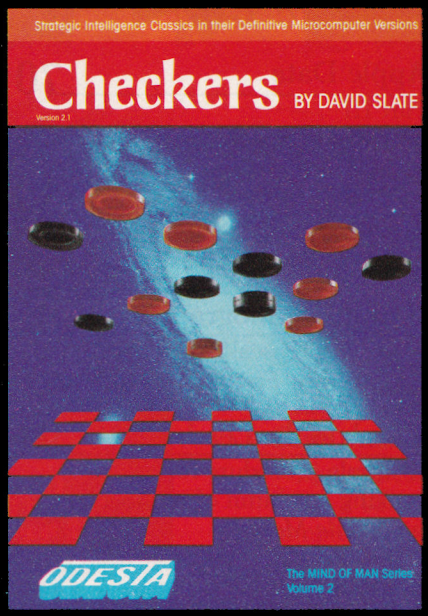
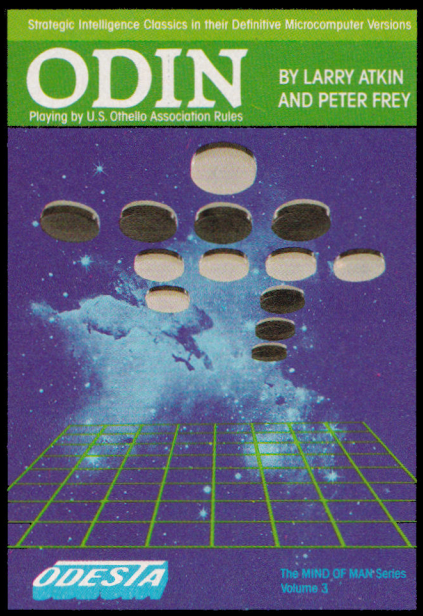
### PETER FREY

Professor at Northwestern University, teaching courses in Psychology and Computer Science. Editor of and contributor to the definitive text on computer chess: **Chess Skill in Man and Machine.** One of the U.S. Othello Association's top-ranked players.

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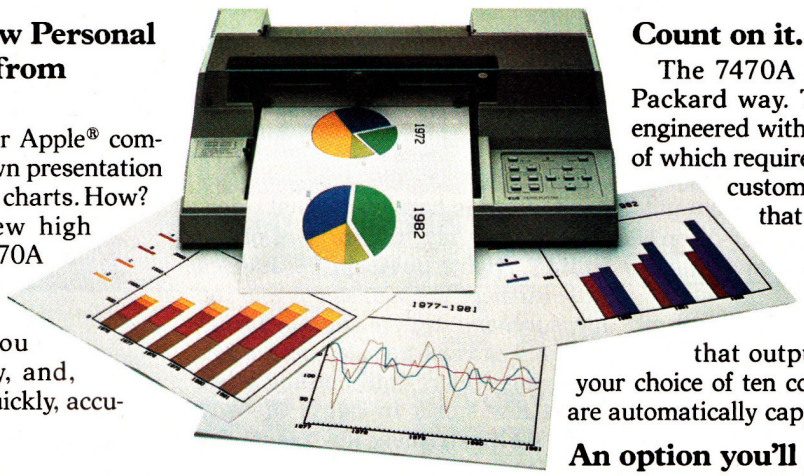


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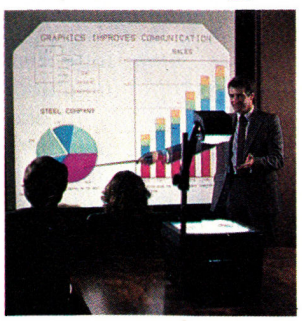

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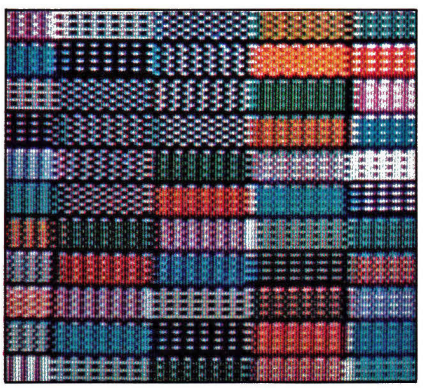

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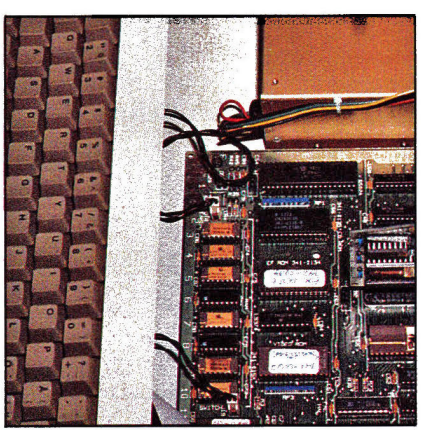

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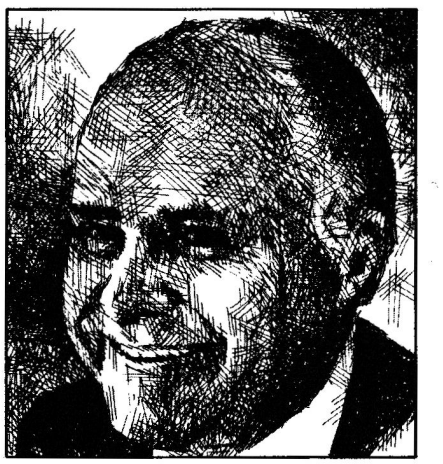
# Hot Cider

## Remarks from the Publisher...
## Wayne Green



### The Mail Order Ogre

While some dealers are pretty upset over Apple's drive against mail order sales of their computers, others are very relieved. But what about us? What about the customers? Won't this mean that we have to pay more for our Apples?

Yes... and no. The situation has several aspects to it which should be understood... put into perspective. The bottom line is yes, the Apple will cost a bit more if mail order discounting is discontinued. The benefit of this is that only in this way can Apple stay in business—and none of us want to own orphans. Just ask any Processor Tech owner, Digital Group owner... and so on. Once the parent company is dead, the computers they've made are soon curiosities for collectors.

To put this into perspective, let's look at what is involved. (Mind you, I'm writing about *discount* mail order, not ordinary mail order—we still have a vigorous need for mail order.) This all starts out innocently enough, with a dealer running an ad in a national magazine for some item at the normal price. By virtue of his advertising he gets sales from the areas of other dealers, forcing them to do competitive advertising. This is great for publishers—we love it—and it sells things just fine. Advertising really *does* sell.

The problem starts when one dealer decides to grab a bit extra in sales by cutting his price below the others. This does two things. First it stops all sales at the higher price instantly. Second, it gives him an increase of sales from other dealer territories, at least until they rush out their ads matching the price.

This price cutting keeps slicing the margins thinner and thinner, until dealers with normal overhead costs for salesmen, service, inventory and so on can no longer compete. They drop the product, since it will only sell at the discounted price and they can't afford to handle it at that price.

Well, you say, the survival of the fittest... right? But let's look at this a little further. The next step is that the few surviving dealers are still cutting prices to grab more sales from other surviving dealers until nothing is left but a few stores in out-of-the-way spots with extremely low overhead, little inventory, no service, and maybe one or two employees to handle the paperwork.

**"...even though most prospective customers read the discount ads, they don't want to buy from a mail order house..."**

Big deal, so the customers are then able to buy at the lowest of low prices—and that's wonderful for the customer, right? No! The fact is that even though most prospective customers read the discount ads, they don't want to buy from a mail order house and know they'll have little or no service, maybe be unable to return the unit if there is a problem... and so on. Often they have questions, want to see the unit in operation and so on, so they just pass up the equipment and buy something they *can* see locally, but which has not been discounted by mail order advertisers.

Surely Wayne is making all this up just to back up Apple and get on their good side. No, Wayne likes being on the good side of any manufacturer, but he doesn't twist things to get there. In this case I'm writing from personal experience with the ham radio market, which was almost destroyed by mail order discounting—dealers along with most of the manufacturers.

At one time, before the discounting got going, about a thousand stores sold ham gear. I know that because I publish a ham magazine and these stores all carried it for sale over their counters. These thousand stores also acted as magnets for thousands of teenagers who developed an interest in electronics and wanted to buy parts to build gadgets... learn more... and take ham classes.

By the time the mail order discounters got through (and they are not really through yet), the thousand stores had become about a dozen, with most of them in serious trouble.

A few years ago, a ham or prospective ham could walk into a ham store and see the latest in ham gear—talk about it with the salesmen (who were hams) and even take the rig home to try it out. If anything went wrong the store would put it on the service bench and have it fixed in a few minutes. Today 90% of the hams have to either buy their equipment by mail order or not buy it. Most

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have opted for the latter, forcing most of the manufacturers out of business. These are the same manufacturers who watched with glee as their sales mounted when the retail prices were discounted. This glee turned out to be short-lived.

Just three years ago there still were a dozen ham stores in New England. Today there is one—just one—left. This one survived by moving to smaller quarters in New Hampshire, where there are no sales taxes, and by paring down to about two employees (from a dozen a couple of years ago). Service? Forget it! They had to close their service department a year ago—they just couldn't afford it on the margins left to work with.

Ham radio has been in the doldrums for quite some time. The lack of stores selling ham gear is not the only reason for the near death of the hobby, but it certainly has been contributing to the problems.

The sales managers of most firms are so wrapped up with the sales chart, sacrificing almost anything for higher sales next month or next quarter, that they forget that they are going to lose out in the long run. The ever-increasing orders from a discounter look great to the sales manager, who often extends even deeper quantity discounts to the discounting mail order firm, often allowing it to sell the equipment at below the regular dealer wholesale price.

This has already happened in the computer business. I've had reports of smaller Commodore, Atari, and TI dealers all getting this surprise. . . and usually having to go out of the business of selling these computers when local discount houses came on line. How would you like to order a bunch of computers that are supposed to retail for $239, and to pay $189 for them, only to see them advertised the next day at a department store for $179? Your supply won't move until you at least match that price. The manufacturer says, "Tough luck."

In the computer field we have a special problem above and beyond that of the ham field. Here most prospective customers expect a lot of hand holding, both before and after the sale. This salesman-time costs money, and it has to come from somewhere. Most customers prefer to buy their computers from a nice looking store instead of a warehouse. That costs, too—a bundle—for the much higher rent, the fixtures, the salespeople, and so on. We want these amenities, but we'll go to lengths to avoid paying for them.

Yes, I know, I make a tidy sum running these discount ads. I suppose, if I were interested in the short run, as many sales managers are, I'd shut up and smile while the money rolls in. But I feel I have a vested interest in the survival of the firms in this business—and that means encouraging manufacturers to cut out the discounters. I could keep these discounters out of my magazines—I have control over the ads I run—but my competitors would go right ahead and run the discount ads, so I'd end up being a broke altruist. I'd rather be a wealthy pragmatist.

**"I feel I have a vested interest in the survival of the firms in this business."**

It all adds up to Apples—and any other computers sold by smart sales managers—costing a bit more, but with you getting a lot more service and support. In the long run, I think you're getting the best of the bargain—and you'll keep the good manufacturers in business.

All this has to do with *discounting* by mail order, not mail order in itself. Indeed, without mail order sales few of the larger firms in our business would be there: They really had to use mail order to get started. Only after the volume of sales has picked up and the demand for the product is widespread can a new firm afford to sell through dealers. This is why some of the very best bargains in new products are being found among the mail order ads. ■

# FIRST THINGS FIRST. LEARN ALL ABOUT IT!

When you don't know the first thing about your new Apple II* you need a friendly, cheerful, easy going teacher at your side. And the ELEMENTARY APPLE is just that kind of book.

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# What's New This Month?

## Everything from the Apple IIe to ZARDAX awaits you.

What could well be the biggest news from Apple Computer—the Apple IIe—is introduced to *inCider*'s readers in this, our third issue. Inside is a look at the two models of the machine, including a tour of the keyboard and the inner workings. New printable characters and the calls to soft switch locations appear in tables for easy comprehension and reference. All-in-all, a most timely piece.

What else? Well, an article by Barry Bayer deals with the mammoth computer show known as Comdex, recently held in Las Vegas. Bill Basham presents a utility to aid in duplicating your monitor's screen via a printer into hard copy.

The Applesoft Adviser continues instruction for those who want to learn more about Basic, and an easy-to-use word processor, The Personal Secretary, finds favor with author Jerry Brieger. An adventure game from Sirius Software is favorably reviewed by a new contributing author, Rich Brown, and Ron DelPorto tells the world what it's like to *win* an Apple computer.

Want a program that'll print mailing labels for you, without requiring a word processing or database program to accomplish the task? Try William Burkhard's simple label printer program. It accepts input directly from the keyboard and prints what you want, when you want it.

Peggy Burnett concludes her series on file data retrieval, and our own Hartley Lesser reviews in depth a professional word processing package called ZARDAX. Greg Glau's business column discusses the trials of businessfolk required to write their own programs, and some methods of avoiding Murphy's Law. Fred Huntington complains about software prices, and James Florini's Pascal utility aids those who must write bibliographies.

Fudge It! This issue delves into shapes, colors and games, while those who like to tinker and meddle with hardware can try building Joe Magee's EPROM Programmer. He will show you how to manage the task painlessly. Bill O'Brien's acclaimed III's Company column sheds more light on the computer that has been ignored *too* long, and Paul Raymer describes how he entered and mastered his computing career.

Spy's Demise, a new arcade game from Penguin Software, is reviewed, as well as the book *Apple II Assembly Language*. John Stephenson gives *inCider* readers the opportunity to never ever...well, hardly ever... lose disks again. His Labeller program prints a label for your disk, or protective jacket, that tells the world what programs are on that disk. The Software Farm's Monster Mash is examined by Lee Sumner, who also introduces a utility entitled Two Keys to Success.

And there's even more. Please don't hesitate. Whether you're a front-to-back, or back-to-front, reader, *inCider* will make a great deal of sense to you. Enjoy, and watch for the April issue for an answer to the question..."Sure, I'd like to get a IIe, but will my software work on it?" ■

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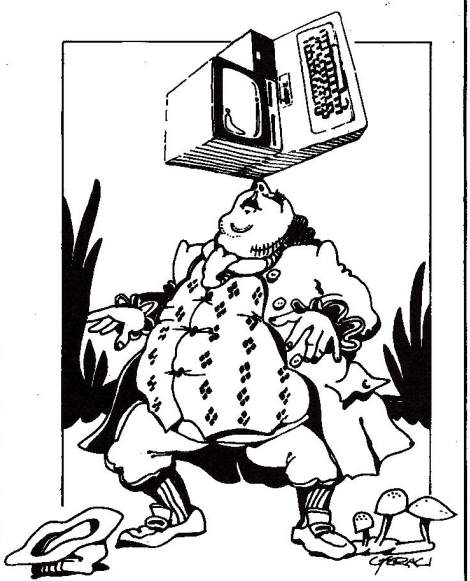
# Fermentations

**by Hartley G. Lesser**
**Technical and Review Editor**

# Tasteless Trends?



Let's offend as many people as possible. This is what some software companies seem to be saying to the consumer. These firms are well on their way to alienating those very members of our species we've been courting into computer ownership these past years. Through insult, profanity and pornography, this goal should be easy to attain. With programs such as Custer's Revenge, users won't be safe booting up an unlabeled disk. Isn't there enough filth elsewhere without sullying computing with this form of disease?

The program mentioned was written for the Atari computer and features Custer violating a naked American Indian bound by her hands to a stake. All this in the full glory of high-resolution graphics, with Custer manipulated by the player's joystick.

Companies that market such material have a "What, me worry?" attitude concerning possible legal actions resulting from the production of software porn. The County District Attorney has problems prosecuting burglars and robbers, never mind a software manufacturer. How much time do you think a local law enforcement agency will commit to dealing with this problem? And before any agency would even think of starting an investigation, there have to be statutes to enforce. A simple city ordinance, weighed in the same halflight as an infraction, is certainly no deterrent. There's no answer to be found in the judicial system. That's been proven in the past.

Suddenly, we come face to face with the fear-word *censorship!* Oh, my heavens, this man's talking about violating freedom of speech, freedom of thought, freedom of expression, freedom of enterprise. I certainly don't advocate book burnings, movie burnings, or disk burnings. But I don't enjoy my freedoms at the expense of someone else. I also believe that anyone can censorshi__!

Parents who worry that their children are picking up obscenities at school or from the street now have another reason for concern. Without even leaving home, children can get an unneeded dose of porn by simply sitting down at their micros and running one of these programs. They'll also see the benefit of learning to program. After all, they're bound to notice that there's easy money to be made writing and producing offensive material. The youngster will be scolded for running the program, if caught. But doesn't the mere fact that the parent had such software in the house express tacit approval of its purchase and existence?

Thanks to programs such as Custer's Revenge, all of womankind and all Native Americans have suffered further indignity through yet another channel—software porn. Even now, the brilliant minds that code such trash might be working on dragging more history through the muck and mire of racial and sexual bigotry. The possibilities are endless!

It's only a program that runs on Atari, you say. We Apple owners have nothing to worry about. Not so, my friend. For a trend has been established. Yesterday Atari was the victim—perhaps tomorrow one will be released in DOS 3.3. Most of us will simply sit back and read an angry magazine editorial decrying the existence of software porn. Some will shake their heads and agree with the diatribe, and then turn to the next page. Others will defend (not necessarily to the death) the businessperson's right to produce and sell whatever he or she can to a buying public. No matter what side you're on, doesn't the line have to be drawn somewhere?

The computing community has tolerated the existence of this material. My concern is that what has been a fertile and productive field is beginning to succumb to some pretty nasty weeds. Weeds tend to choke out the beauty, unless they are yanked out by their roots. So far, the weeds have thrived in benign neglect. But weeds growing in my own yard don't stand a chance.

Advocate censorship of the programs? Within my own home, you bet! You'll have to make your own decision when the time comes. ■

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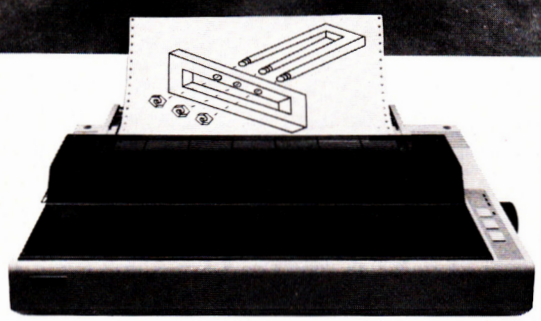

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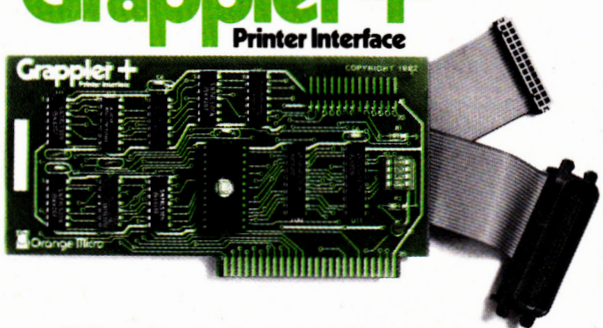


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# If your printer uses your Apple® more than you do, you need The Bufferboard.™

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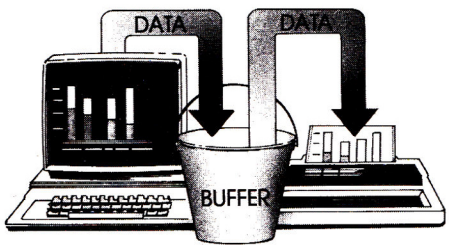


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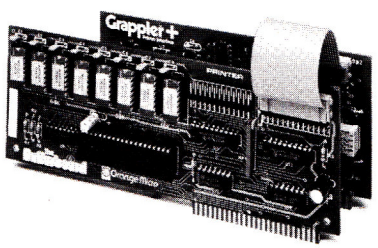


and economical buffering of most popular printer interfaces, including the Grappler + ™ interface, Epson interface, and Apple printer interface. Thirty seconds and a single hook-up are all you need to end the printer waiting game forever.

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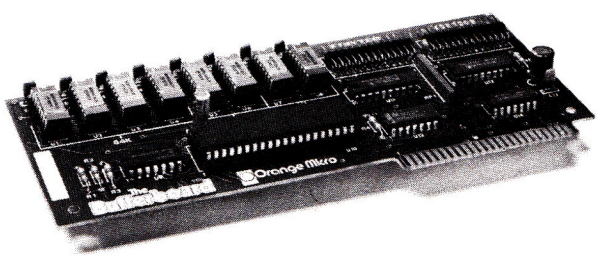


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# Letters

## Tutorials Wanted

I received your first issue of *inCider* and I must admit that I like it. It deals with Apple and what will go with Apple, not a bunch of other machines (CP/Ms) that are of no interest to us Apple users.

There is one suggestion I have for your magazine—write a tutorial series in layman's terms for the Apple II and on programming so the new user can understand it. The Apple book does not do this and if you were to do this, it alone would sell your magazines.

"The Applesoft Adviser" is on the right track. Put some examples in it.

**Bruce G. Nieto**
**RR #2**
**Plattsmouth, NE 68048**

## Easier Branching

I just got my first copy of *inCider* and am very pleased. I think you're off to the right start.

Frankly, one of the main reasons that I subscribed, sight-unseen, was the blurb about the first issue covering TRS-80 to Applesoft conversion. It's something that's been long needed.

On that topic I'd like to make two comments. First, it would be great to have all those conversion tables consolidated into one easy reference chart. That way we could have one sheet to pin up and work from when we really get down to actual program conversion.

The second comment has to do with the discussion of the IF... THEN...ELSE statement found on pages 102 and 103. What the author says is correct. However, if the statement is used strictly for branching, with no other Basic statements (as in his examples) there is an easier way to do it. An example of this might be a statement like

```
10  IF X=0 THEN 100 ELSE 200
```

This could be rewritten as

```
10  IF X=0 THEN 100
15  GOTO 200
```

However, to maintain the one line-one statement format of the original TRS-80 statement, it could be better written as

```
10 ON((X=0)+1) GOTO 200,100
```

The point is simply that where an IF...THEN...ELSE is used only for branching, the ON...GOTO or ON...GOSUB is the best Applesoft replacement statement to use.

**Robert R. Devine**
**PO Box 10**
**Adona, AR 72001**

## pH Reader Appealing

Wow! Just finished savoring every "bit" of your Premiere Issue. It is deliciously conceived, beautifully printed, and a valuable addition to Apple literature.

My thing is education—an area that will be receiving increasing attention in the literature as schools "tool-up" for the third revolution of civilized man (Agricultural, Industrial, and now the Technological).

I especially liked "Speedy Alchemy" by Rolf Deininger and Carl Berger, Jr. Although our school has an A/D + D/A interface card, the under-$20 pH reading device described for the Apple II is most appealing (no pun intended)!

**James C. Benton**
**Chairman of the Science Department**
**Lake Forest High School**
**1285 McKinley Road**
**Lake Forest, IL 60045**

## Applewatch

I have just read the first issue of your magazine and am impressed. This letter is to say thanks, complain a little, and ask for information on "How to Write for *inCider*."

What I liked about the magazine was the type of columns that you featured, plus the ads, and, most of all, your TRS-80 to Apple conversion hints. I felt the articles were well-written, informative, and helpful.

Now what I didn't like. Too many reprints or extracts from other magazines. There was a definite paucity of original research and/or information. Also, I got tired of reading how great a magazine you were going to be. You're great in my book already.

My biggest complaint is the Applewatch column. It was a complete zero. True, Apple is coming out with the Lisa in 1983, but what will it look like? True, Apple is rumored to be working on a Super-Apple II. The rumor mill originally hinted that the Super II would be out in August 1982, or Christmas at the latest. But what does *inCider* think it will look like? Same as the Apple II+, but with the language card, 80-column card, and/or CP/M? How much will it be? How will it affect the cost of the Apple II+, both as a new purchase and in the used market? These are the types of answers Applewatch should be providing, not warmed over hash from other sources. How about taking these questions directly to Apple? How about being a primary source?

**Jack A. Beyer, CDP**
**1310 Watson Ave.**
**Winston-Salem, NC 27103**

## Peek and Poke Help

I received my Premiere Issue of *inCider* and enjoyed it. In reading your various articles it appears you're looking for something that the other magazines are lacking. And I think I know what that something is. To date, I have been unable to find a magazine that has taken the time to explain the use of peeks and pokes.

I went and purchased the book *What's Where in the Apple?*. The book does contain the information, but for a novice the information is hard to understand. Therefore, I hope that your magazine can take the time and trouble to explain those mysterious internal Apple workings that so many programs are using.

If you are unable to include such an article in your magazine, then perhaps you can recommend a book that does explain the peeks and pokes and other strange workings within the Apple.

**Gerald H. Foertschbeck**
**2715 Beechland Ave.**
**Baltimore, MD 21214**

## *inCider* Plus

I am excited about *inCider* and am thoroughly enjoying the Premiere Issue, which I just received yesterday. I

# Penguin Graphics Software

## Which is for you?

### The Complete Graphics System II

*by Mark Pelczarski*

***Complete Graphics System** is written for the non-programmer interested in doing a wide variety of graphics and design on the Apple computer. Included are options for two-dimensional drawing, with lines, circles, ellipses, and an automatic 108-color filling routine. Also, you can mix text with graphics, with various colors, sizes, and spacing, and easily create Apple shape tables. Three-dimensional options allow you to draw, edit, and manipulate 3-D objects in perspective—without having to use coordinates. A 2-disk set of additional text fonts is available separately.*

### Special Effects

*by Mark Pelczarski and David Lubar*

*This is also a non-programmer's package, but oriented more toward computer artistry. It's also an ideal complement to **The Complete Graphics System II.** It has a brush module that lets you "paint" using a joystick or **Apple Graphics Tablet**, with the screen as your canvas and a choice of 96 "brushes" and 108 blended colors. You can also magnify any portion of the screen 2 or 4 times for detail editing, perform mirror images, exchange colors, and move parts of pictures to other areas of the screen. Also included is a packing routine that lets you store more pictures on each disk.*

*Although both **Complete Graphics System II** and **Special Effects** are written for non-programmers, they are provided on unprotected disks, and instructions are included for using the graphics and machine language routines in your own programs.*

### The Graphics Magician

*by David Lubar, Mark Pelczarski, and Chris Jochumson*

*This one is written with the programmer in mind; for anyone who wants to put professional quality graphics in their own software. Fast machine language animation and picture drawing routines are included for use in your own programs, and they're extremely easy to use. Using the editors provided, you simply draw your own multicolored shapes, draw their paths, and combine up to 32 independent shapes with paths and starting locations. The result is a machine language animation file that you just add and control with your own program—it does all the graphics work for you! The adventure-game picture editor works the same way: just draw, save, and add the redraw routine to your program. It increases a disk's storage capacity from 12 pictures to hundreds. A tutorial manual is included with examples of controlling animated objects with joysticks, detecting collisions, and a multitude of other useful hints and examples. For samples of what can be done, see any of our game packages, including **PIE MAN, Transylvania,** and **Spy's Demise,** as well as those from several other companies using **Graphics Magician** for the graphics in their software.*

***All of our graphics products are on unprotected disks for your convenience.***

*No fee is required for using our graphics routines in other programs. All our license requires is that it is stated that our graphics routines were used. We are also most interested in publishing good, new products, and beyond our graphics software we can offer further help to authors publishing through Penguin Software.*

*Instead of offering our own superlatives, we recommend that you read what others have said about our graphics products. Listed here are some of the reviews we've found, along with a few quotable quotes:*

### *Graphics Magician*

*"recommended to anyone wanting to work with Apple's high resolution graphics for whatever purpose...definitely a program Apple users should have in their software library", **Byte,** Nov. 82.*

*"miraculous and marvelous," **Creative Computing,** Jan. 83.*

*"makes a graphics magician out of each and every Apple user", **Softline,** May 82.*

*Other reviews: **Peelings II,** Sept-Oct 82. **Softalk,** May 82.*

### *Complete Graphics System II*

*"The program earns its name...it brings together at a modest price so many different graphics tools.", **Softalk,** July 81.*

*"The three-dimensional utilities verge on the phenomenal", **Creative Computing,** June 81.*

*"provides capabilities that go beyond the wishful-thinking stage and painlessly use much of the Apple II graphics potential", **Infoworld,** March 1, 1982.*

*Other reviews: **Softside,** #33. **Peelings II,** Nov-Dec 81. **Cider Press,** Sept-Oct 82. **Call-A.P.P.L.E.,** Nov 82*

### *Special Effects*

*"With **Special Effects**...the Apple computer comes very close to emulating main-frame computer graphics systems costing as much as $250,000 for only $39.95", **Creative Computing,** July 82.*

*"If you can afford only one computer graphics package, this **(Complete Graphics System/Special Effects** combination) is the one to buy", **SoftSide,** #33.*

*Other reviews: **Popular Science,** Nov 82. **Softalk** and **Peelings II,** March 82. **Cider Press,** Sept-Oct 82.*

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*the graphics people*

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am also looking forward to many months of valuable Apple info which, based on this first issue, I'm sure you will provide.

Jim Ganz
82 Spring Lane
West Hartford, CT 06107

## Book Review Section?

Your Premiere Issue of *inCider* is not the work of someone Green to the Apple. It shows good management in selecting the feature writers and much thought in not just dumping quickie game programs on the public.

I must admit, I received the magazine yesterday and had time to only scan. I did read Dan Bishop's tutorial and hope that his monthly contribution continues to be on the same level.

I will make a couple suggestions:

1) Peel-off labels for use on the reply card and for address change.
2) An annual index of programs, articles, etc., to help locate information.
3) A book review (in addition to program review) section so that we have a better idea of which books give the most help to the green Apple byter.

I sincerely hope that everyone appreciates your magazine as much as I do so that you can continue to grow and attract good computer writers.

Barry Wiener
39-03 233 St.
Douglaston, NY 11363

## Cooling Coffee

There it was in Saturday's mail—the anxiously awaited "Premiere Issue" of *inCider*. Wife, kids and dog were ignored, and my coffee cooled as I became literally absorbed into your new creation. I subscribed solely on Wayne Green's reputation and past history—particularly with *80 Micro*. I am not disappointed!

You asked for comments, ideas, suggestions, etc. For my purposes I'd like a format similar to *80 Micro* with some devotion to electronic "tinkerers" like myself. Home-brew and construction modification ideas would be *most* welcome.

With tongue in cheek my wife criticized the lack of game or educational programs. I took up the sword and shield in your defense (figuratively of course—I'm not that crazy) and explained it was your intention to include such items in future issues. For the sake of my much-wounded male ego please give it consideration.

Thanks again—hurry with issue #2.

Henry M. Ciesla
16 Fradine Drive
Cheektowaga, NY 14227

## Apple II Emulation Mode

I've just read your Premiere Issue and am pleased to have a fresh view of the world of Apple computing. It occurs to me that your magazine may provide a good forum for something that has been bothering me for some time. I have yet to buy a computer and am feverishly debating the choice between an Apple II and an Apple III. I feel I need the computing power and software development capabilities of the Apple III, but commercial software for the III has been very slow in coming. I am attracted, on the other hand, by the *wealth* of software available for the Apple II. My biggest concern is the Apple II Emulation Mode on the III. I've never seen a definitive discussion of the problems with the Emulation Mode, just a lot of generalities about people who have been disappointed or frustrated by it. So my request is for someone to provide an *in-depth* study of just what the Emulation Mode can and can't do.

The bottom line is that I don't want to buy an Apple II just to play games or use the proliferation of software available in 48K/40-column format, but I'd really like to be able to use many of those programs on an Apple III. If we can get something going through your magazine to address this problem, including possible solutions to making the programs work, I would be very grateful.

Incidentally, I'm sorry to see that Apple Computer is not pursuing the home/hobby potential of the Apple III. There are a lot of us out here who would like to see it go the way of the Apple II, with innumerable accessories and programs plus detailed analyses of how it works and what can be done with it. But as long as Apple pushes it as almost exclusively a business system, software and hardware companies seem reluctant to take the plunge.

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*—the editors*

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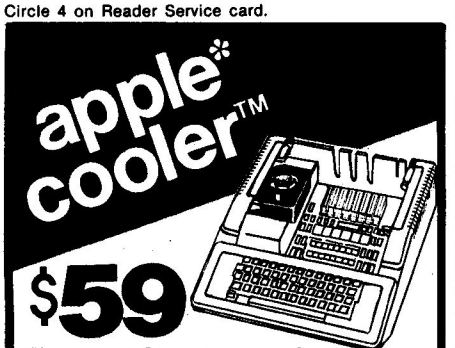


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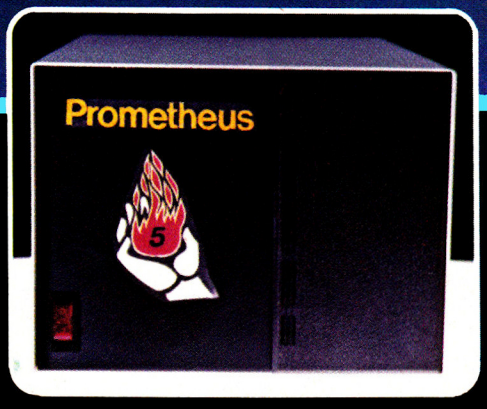


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COMMUNICATIONS

# Network Nation's First Novel

## Fictional work finished by Canadian in 61½ hours.

A black, chauffeur-driven limousine glides up to the curb outside the arts center. Out jumps a man in a black-sequin sweat suit and black cowboy boots.

As he enters the center, the partyers pause between sips of champagne to applaud.

He mounts a black patent-leather stage. More applause. Cheers.

His valet uncorks a bottle of Dom Perignon.

So began the production of the first novel written expressly for the Network Nation in 61½ hours.

"I proceeded to get stupendously intoxicated," author Burke Campbell said in a telephone interview, "and proceeded to write the novel that was to become *Blind Pharaoh*. To this day, I have no idea how it was done in that condition."

Campbell, 34, may be creating a new fiction genre: the speed novel.

"I had a very general outline," he said, "but for the most part, it was right off the top of my head. You have to understand that when you have the whole world watching, you tend to do your best."

The most difficult thing about *Blind Pharaoh*, the Canadian writer said, was getting people to believe he could do it. "People keep saying, 'Wasn't it very, very difficult to turn out a good story in three days?,'" he noted. "I said, 'Oh, that wasn't the hard part at all. The most horrible part was going around and trying to convince people that this was the easiest thing in the world to do.'"

Campbell wrote the novel at the ArtCulture Resource Centre in Toronto on an Apple III, using AppleWriter. He proofed each chapter on a second Apple. A representative of

Burke Campbell

Apple Canada reformatted the chapters and used Access III communications software and a Ven-Tel 1200 baud modem to send them to The Source in McLean, VA.

As The Source received each chapter, its editorial department gave it a second proofing and separated it into page lengths. Within 9½ hours after it was completed on Nov. 17, 1982, *Blind Pharaoh* was on The Source ready for subscribers to read.

"Writing a 20,000-word novel on a computer in 72 hours is a stunt," wrote *Chicago Sun-Times* Book Editor Henry Kisor in his review of the novel, "but Burke Campbell pulled it off handsomely. The result, *Blind Pharaoh*, is rough-edged as one would expect, but its splendid narrative drive makes up for that. I enjoyed it very much."

He added, "More important, perhaps, is it's proof that videotext is a going concern as an alternative to the printed book. The technology is here already; all that is needed is a larger audience. And that will come; the only question is when."

*Blind Pharaoh* marked a first for Kisor, too. He interviewed Campbell using The Source's CHAT function. It was Kisor's first phone interview. He is totally deaf.

In the same vein, *inCider* interviewed Kisor using The Source.

He told *inCider* *Blind Pharaoh* was much as he expected it to be. "I did not expect heavy literature," he said. "I enjoyed reading it, for Campbell has talent. I'd compare the novel with published work one finds on the science fiction racks in airports."

"I am not making any heavy value judgments here," he explained. "How can one do that when someone writes a novel in three days? One is happy that there is some entertainment value to it.

"I do think, however, that the major worth of the novel is that it is a trailbreak. It called attention to the possibilities of videotext as a publishing source."

Kisor believes more books will be appearing on videotext. Reference works are already on some systems, he observed, and books in the public domain may be next.

"After that," he continued, "certain kinds of works will be published, but I think they will be specialized types in demand rather than heavy literary works that appeal to a small audience."

"I doubt that videotext takes over all of publishing," he added, "but it will eventually grab a sizable and profitable segment of it."

Campbell, primarily known for his radio dramas, sees videotext as a boon to future authors.

"No one in their right mind would ever talk to a publisher after publishing electronically," he observed. "You write the book. You do it on your own terms. It can be edited right there in your own little factory. Then it can be published all over the world without ever having to come into contact with men in Brooks Brothers suits." ■

# Excerpt From Blind Pharaoh

It was the day after the end of the world.

Philip had managed to strip off his shirt, one black boot, and one sock. He had then fallen backwards onto his bed, where he still dreamed in a state of exhaustion and drunkenness and despair.

Light now entered the huge white studio, the fifth floor of a former warehouse located in the heart of Toronto. The harsh light of day. Of course, the photographs still hung upon the walls. The beautiful photographs. Some taking up nearly an entire wall. All black and white: haunted images of beautiful women in limousines, idle women, quite dangerous, looking out over the disaster. The images were the only thing suggesting that the place had ever been visited by order. The rest of the place was nothing short of a direct hit.

A thousand wine glasses (many half full) littered the great empty space. They flickered in the morning light like so many votive candles. And the floor—the floor was covered with a film of a composite substance—not unlike glue—formed of spilt wine, cigarette butts, etc. It was no small miracle that the visiting hordes had escaped. Even Rascal the cat found itself licking its paws, disgusted by the sight. And what had happened? To put it mildly—the worst. Philip had hoped to pull off a miracle, and had managed to do just the reverse. He had pitted everything on one clever move—and failed.

The blue sofa seemed lonely catching the light which grew more and more intense. The tall windows allowed the full summer light to enter, hampered. But Philip slept on, too frightened to wake. What had happened the night before was just too ghastly.

Only hours before, hundreds of friends and enemies had flowed into his apartment to view his exhibition. He'd received good reviews in the past, and was recognized as an accomplished artist. Unfortunately, the more accomplished you are as an artist, the less employment you get. At least this was Philip's case, because he tried to retain his independence, stay the free-lancer. He took whatever jobs he could get just so he wouldn't have to work in some slave factory of an advertising agency. Let's face it. The economy had all but collapsed and the rivers of money that had once flooded the city had dried to a trickle in the dirt. So Philip did what every truly intelligent person will do. He went for broke. He took the chance. He lived for today without a thought for tomorrow. And he had driven right over the edge, laughing.

In his present state—he began to realize that wasn't the wisest thing to do.

Granted, the idea seemed sound. At least on paper. He would not pay a gallery a huge sum of money to stage his show. He would have it right in his own apartment and handle the press and send out his own invitations, which he designed himself. And certainly, the results were impressive. At least at first.

Hundreds of fashionable people in fashion, dance, photography—in fact—the whole artistic community of the city had appeared in the freight elevator only a few hours before. Representatives of the press had actually got it together to come. The most important, or rather the most influential of the newspaper journalists, was the personable Suede.

He had a gift of appearing personable, with his kind good looks, his rather attention-getting slap of black hair. Actually, he looked a great deal like Hitler without a moustache.

And Angel and Spence showed up—always gorgeous, always the most wonderful pair. And legions and legions of the best dressed, the best turned out, the most talented.

Philip had spent the earth buying booze and having it served by youths carrying glasses on trays which were in fact his photographs. They had been instructed to be generous with the potent reds and whites. Philip had hoped to encourage those with money to spend it freely. Unfortunately, those with money had merely gone mad with drink, and those with little or no money had gone crazy. Soon, everyone was so plastered that none of them remembered they were there to buy photographs. And the rising summer heat had inclined many to drop shawls and jackets and within no time, everyone was interested in the thing that required no exchange of cash.

Philip looked out over his mass of prospective customers and began to realize he was headed for bankruptcy. He had poured absolutely everything he had into this exhibition. The cost of printing the photographs was astronomical. The cost of framing them was staggering. The expense of invitations, booze, all kind of labor was just too much to consider. Surely he had to accept reality. If the frenzied crowd did not shell out money for these beautiful prints—but surely they would! Surely they could see the work, the love, the genius that went into their making! (These are the kinds of thoughts that possess artists and other suicidal species.)

For Philip the reality was too gruesome to think about. The true situation being that nobody wanted the damn photographs in the first place—no matter how wonderful they were. And certainly not during a period of economic chaos. People tended to invest in other things—like food.

Of course, no matter how brilliant the showing, not that many people had the time or inclination to make it to a particular gallery during the normal three week run. Perhaps a few hundred, if one was lucky. So one had to hit big and fast and flashy and pray that one got a rave review.

A review that suggested that not to own one of these prints would be a fate worse than death. And a horrible one at that. With a cheap burial. At least Suede had come

to the event, to be one of the celebrants at the studio on Richmond Street.

And his review cast the most clout—he could turn the buyers out. And he did smile, once. He appeared to smile. But as the evening wore on, and the music played louder and louder, and the crowd got more and more rowdy—and undressed—the young photographer realized that he wasn't selling anything and in his increasing anxiety, stopped trying to charm his guests into buying and became increasingly drunk. His hand stroked his strawberry blond hair, his eyes became glazed with a delighted fear. The enchanted gathering departed sometime prior to dawn.

Philip was alone. He could barely see through the settling smoke of a thousand cigarettes. And when he pulled the plug on the thundering music, the room seemed so perfectly still that he wasn't sure if it was in the building or floating somewhere in endless space. Perhaps he merely imagined himself in a room—when in fact—he was some kind of mechanical contraption—drifting towards a distant star.

He was able to do only one thing. He picked up the guest book which had sat all evening long gathering the names of his persecutors. The fashionable who had come and drunk his wine, and had left him, ruined. To be young and ruined Philip thought is much more horrible than to be old and ruined—because the end is still so far away.

He had tried to read the names, to curse them—to plead with them, and to read also their enthusiastic and hypocritical comments.

"Great show!"

"Your best work!"

"You're a genius!"

The words seemed out of place, like laughter at a funeral. His eyes scanned the pages but his eyesight failed him. The white walls spun. The women in the photographs were laughing now, and the limousines seemed to drive beyond their frames down endless highways. The guest book fell from his hand. He staggered backwards. The book hit a small table by the sofa, and then lodged itself between the sofa and the wall.

Philip went quite pale. His hazel eyes gleamed. His hands went to his shirt, went from button to button, trying to recall the learned behavior which had now become remote. The floor seemed soggy. His boots stuck to the wooden planks with every step. He found the zipper near his ankle. He managed to fire one shoe across the room. One white sock. And then cascaded backwards onto his bed in a tangle of arms and legs and wavering light.

And now, the punishing light of a new, hopeless day flooded his home. He was in such a shattered state that he was not in any way aware of the vibrant sunlight. Of the wreckage of his living quarters. His eyes moved beneath his closed lids. Dreaming. But of nothing he would recall.

And then, suddenly, he felt—even in his unknowing condition—a presence in the room. His eyes jerked open, registering a form. A figure all dressed in black stood near his bed, towered over him. Because the light was behind the intruder, Philip could not see anything but a silhouette. His mind could not realize what was going on—he did not fear that he was going to die, that the intruder meant him any harm. He only saw—for one instant—a man looking down on him. Philip closed his eyes, opened them again.

The figure in black was gone. All that remained was Rascal wanting his breakfast (as any cat would)—and the cold light of day. ■

GAMES

# Games on Cable TV

## Joining The Games Network will put a 6502-based micro in your home.

The arrival of The Games Network this year may increase the demand for Apple peripherals.

The Games Network?

Starting this September, International Cablecasting Companies Inc. of Los Angeles will be feeding 20 video games a month over The Games Network to an estimated 6 million cable viewers.

Families wanting games programming buy it from their local cable company. The household receives from the company International Cablecasting's hardware—a 6502-based microcomputer with 64K of RAM, 24-key keypad, and 280 × 192 high resolution color graphics.

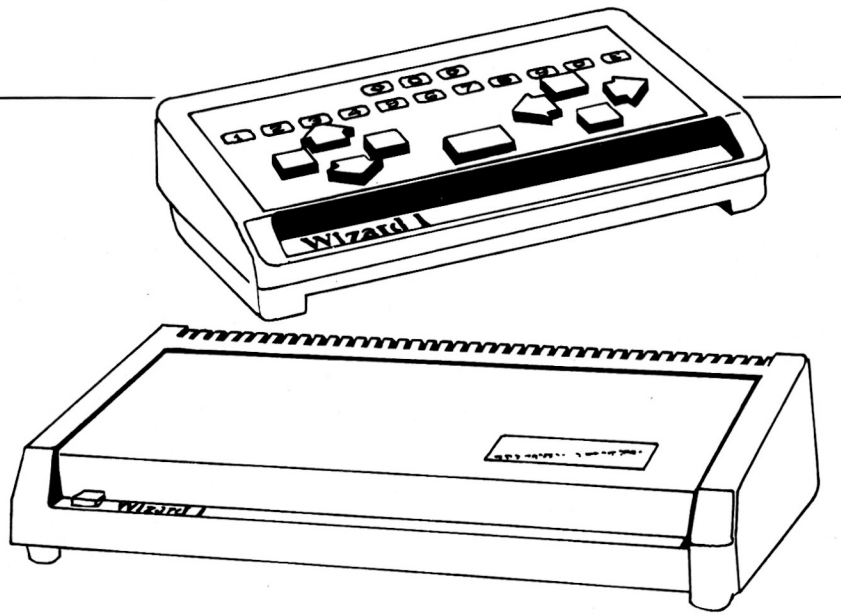
International Cablecasting's micro, called the Wizard I, also has ports for a printer, disk drives, a video disk player, an ASCII keyboard, joysticks and game paddles. "We'll be providing all sorts of software via cable television in addition to the video games," observed Director of International Affairs and Executive Vice President Thom Keith.

And the Wizard is tailor-made for Apple owners. "Almost everything we have is Apple compatible," Keith said.

But having a Wizard in your living room isn't quite like having your own micro.

You can't hack around inside the machine. If the case is opened, the unit won't work, and you'll have to call a service person to revive the micro.

And you can't take the computer over to your neighbors' for a casual evening of fun. Each Wizard has a




**The Wizard I.** Everything Apple-compatible.

unit address and system address. When a unit is turned on, the head-end mini checks those addresses. If they don't match, the Wizard's channel access is blocked.

The system also contains safeguards against pirating its software.

Currently, Interac Corporation, which did all the interactive technology for Walt Disney's Experimental Prototype Community of Tomorrow in Florida, is manufacturing the Wizard. But Keith said Pioneer, the stereo people, will take over production in 1984.

How much does it cost to produce the Wizard? "We're not exactly sure yet," Keith confessed. "We feel we're going to lose money on the first units going out. They're expensive to produce, let's put it that way."

The Los Angeles gamesters recommend cable companies charge subscribers $49.95 to install the Wizard I. The cable company keeps $15 of the installation fee and the customer gets $20 when he terminates his subscription.

Subscriptions to the network are expected to cost $14 to $15, depending on where a subscriber lives.

The local cable company receives, without charge from International Cablecasting, two Digital Equipment Corporation minicomputers to install at the head-end of the TV system.

"Only one computer system is in use at any given time," the promotional material for the network explained. "The second serves as a backup. So if one computer should go down, service to subscribers will be maintained automatically by the secondary equipment."

International Cablecasting added, "This is one of the most fail-safe systems in existence."

Cable companies are hot over broadcasting video games, according to one published report, because they see them as a means of drawing in more cable subscribers.

"The marketing surveys that were done," Keith noted, "indicate about a third of the current cable subscribers show very, very high interest for the games network and would probably sign up for it if it were available to them.

"They also indicated about 10 percent of the people that are not subscribing to cable now for any reason would subscribe to cable if they could get The Games Network.

"We're looking at a pretty high penetration."

That notion hasn't been overlooked by others in the industry. Mattel and the General Instrument Corporation have fired up a cable venture to deliver games to an Intellivision console. And, according to one observer, several other companies are looking into cable games.

Keith, a pioneer in cable programming, and his partner, Larry Dunlop, formerly a rock 'n' roll performer and personal manager for celebrities, began to shape their ideas about the games channel in January 1982.

In March, they formed International Cablecasting and set up shop in Hollywood at the Sunset-Gower Studios, former home of Columbia Pictures.

Later, the firm moved to a spacious Queen Anne home constructed in 1895. Keith sees the move as symbolic. "One of the main reasons we chose this location," he said, "is that we perceive ourselves to be the 'third wave' in home entertainment and education—and *home* is the key word—so we've created a home environment that's a working environment."

Another important word (and one that might be used to defuse criticism of the network) is education. Keith, who directed *The Boob Tube* in 1973, said 25 percent of the programming on the network will be educational.

The network's promotional material added: "Parents would rather kids played arcade games at home. Kids would rather have unlimited plays. Providing a wholesome form of recreation and instruction pleases civic leaders."

Since last September, Keith and company have been testing their ideas on Group W's 40,000 subscriber cable company in Fullerton, CA.

"It seems to be working very well," said Keith, the first provider of regularly scheduled cable programming in the United States.

He added, "We've been looking at some of the nuances we should put in the production model of the in-home unit. The whole idea is to make it as user-friendly as possible and to increase the playability of it. To make it easy to operate and as sturdy as possible so it can withstand a lot of hard use in the home environment."

Some of the games tested in Fullerton include Snack Attack, a Pac-Man-style game; Aztec, a multi-level maze game; Night Mission, an electronic pinball game; and Ruskie Duck, where a player must find a Russian duck containing the secrets to the MX missile.

International Cablecasting contends it will be getting the best games for its viewers: "We pay ex-

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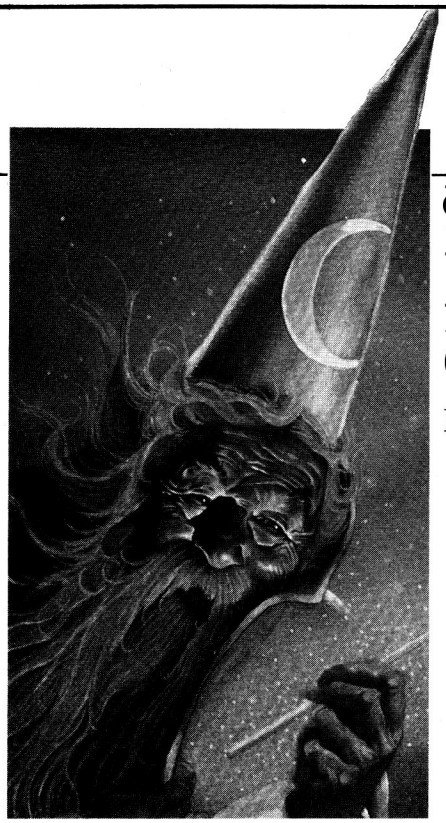

cellent royalties, based on the total number of The Games Network subscribers. And exposure on The Games Network is indicative that the game is a hit, meaning that it will increase sales to people who play the games on computers, home games machines, and at arcades."

Each month, five of the 20 games offered are replaced with new games. The head-end computer automatically tallies the games played and uses the information in determining which games to replace and which to keep.

Games will differ from region to region of the country, Keith said. "The 20 games playing on a cable system in Santa Monica," he noted, "may be entirely different from the 20 games playing in Savannah, Georgia."

Keith's firm won't be stopping with The Games Network. For late 1984, it's planning the IQ channel, offering college, high school, and other kinds of courses.

And for 1985, it's planning the Fantasy Channel. Using the video disk port of the Wizard, a viewer will be able to download software allowing him to interact with the disk player. "He could direct his own movies," Keith said, "and get into role playing, fantasy, and all kinds of things." ■

GAMES

# Firebug

## Ohio officials condemn Muse Software for marketing "deleterious" game.

While the controversy raged over Custer's Revenge—a video game alleged to depict the rape of an Indian woman by the well-known leader of the 7th Cavalry—a game for Apple computers stoked the ire of state officials in Ohio.

Apparently Ohio's fire marshal and director of commerce were told *Firebug*, by Muse Software of Baltimore, MD, centered on an arsonist setting warehouse fires.

In a letter to Muse, Commerce Director J. Gordon Peltier said:

"To market such a game is unconscionable. In 1981 in Ohio alone, 11 persons were killed as a result of arson and property damage exceeded $42 million. In the interest of public peace, safety and welfare, and basic decency, I implore you to cease marketing this deleterious game."

According to Muse, there was some confusion about the game's documentation and advertising. They have been rewritten to clarify things.

"The object of the game is to escape a five-level maze which becomes increasingly complicated at each level," Marketing Director Rhonda Uretzky-Miller wrote to *inCider*.

"Elements of fire and explosions are for visual interest and to add speed and urgency to the race. Points are awarded for the amount of maze destroyed just as points are awarded in shooting games for the number of opponents you shoot.

"'Firebug' is a video fantasy, as all computer games are. The fantasy we built around our game is not that you are an arsonist setting an occupied building on fire, but that you are guiding a mechanical 'bug' through a series of mazes, racing against time and fire. . . .

"[T]here is no intent to encourage arson either in the [game's] illustration or copy." ■

**Dark Crystal.** Roberta Williams created a video-game version of Jim Henson's film *Dark Crystal* for the Apple. The game is distributed by Sierra On-Line Inc. of Coarsegold, CA.

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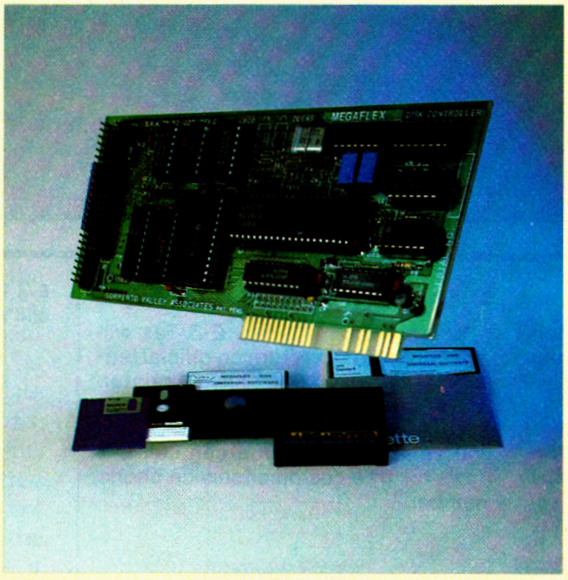


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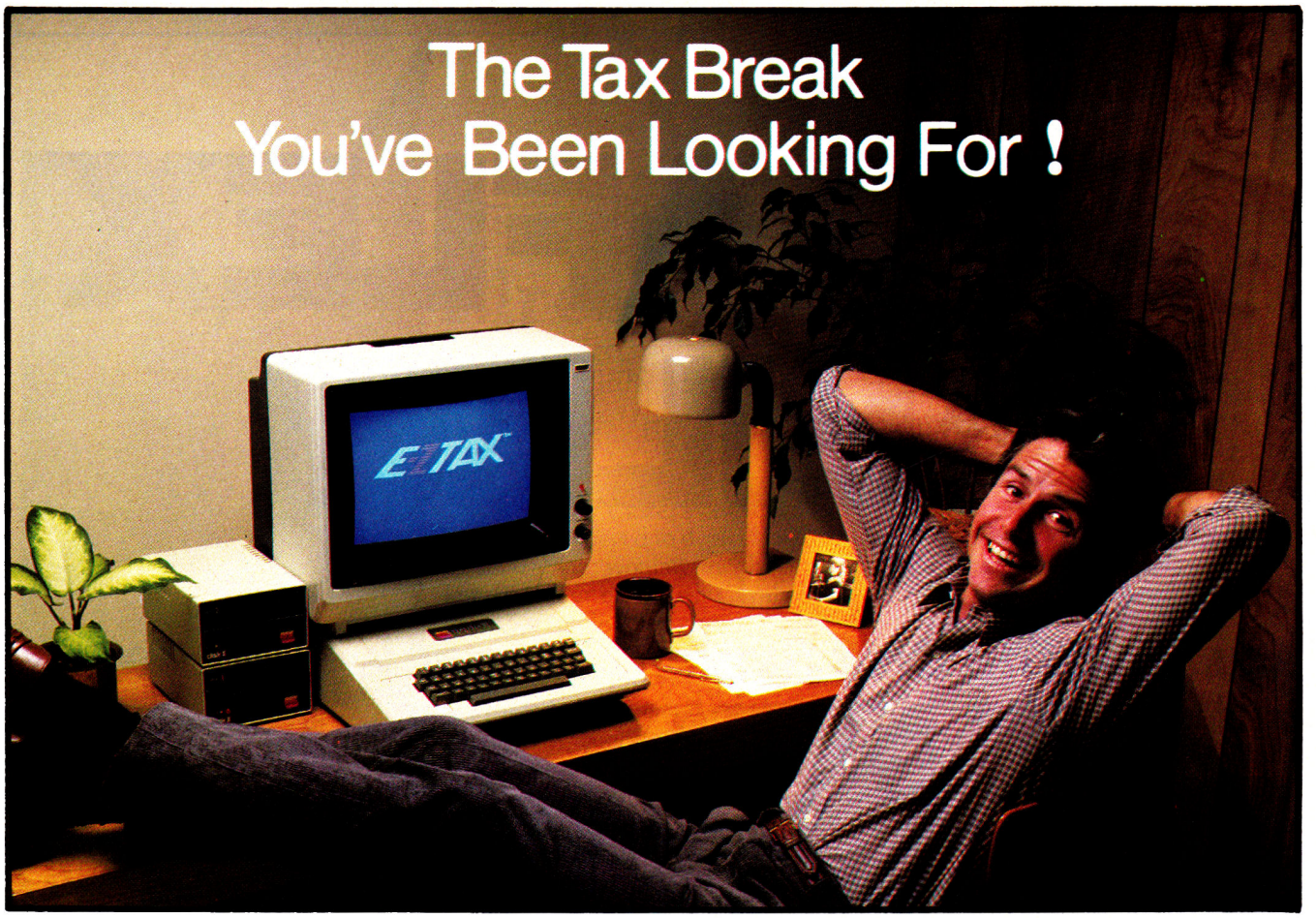


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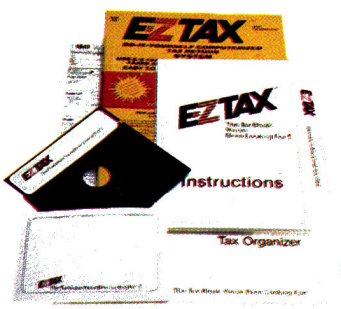


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# The Applesoft Adviser

**by Dan Bishop**

# Apple Instructions I

The previous two articles in this tutorial series described in depth the use of variables and arrays in Basic programs. Although several examples were provided in those articles to illustrate the concepts, it was impossible to avoid using several Basic instructions that I hadn't yet covered. I hope that you are still with me!

This article will initiate a series exploring the various instruction statements that make up Basic. As before, I'll include relatively simple examples and then conclude with one or more advanced examples that may find general use as parts of more sophisticated applications.

This month, we'll deal with the For/Next/Step instruction set and the Read/Data/Restore input statement set. With these as background, you can get up a simple computer date book program in which the database (that is, the list of appointment, dates and times) is actually written into the program. Although this is not the most efficient technique for the inexperienced operator to handle, it will present no problem at all for you, the programmer. This method has the additional advantage of not requiring any tape or disk data file manipulation, keeping the program relatively simple. I will also demonstrate how to trick the Apple into doing only a partial Restore to some point in the middle of the Data statements.

### Constructing a Loop

One of the greatest advantages in using a computer comes from its ability to carry out the same type of operation over and over again. Although you could repeat the instructions in the program, line by line, as many times as necessary to repeat the specific operation, it is much simpler to write the instruction set that carries out the desired operation only once and then tell the computer to jump back to the beginning of that instruction set each time the operation needs to be repeated.

To do this, you will need to define some variable, such as I, to serve as a counter. The counter is given an initial value of 1. Each time you jump back, or loop back, to the beginning of the instruction set, add 1 to the value of I, and then test the new value of I to determine whether the desired number of loops have occurred yet.

If they have, the program will not loop back but will proceed on with the rest of the program. If the value of I remains less than the required number of operation reiterations within the loop, the program will jump back yet again. Figure 1 shows two common methods for flowcharting this type of instruction sequence, using 25 as the number of times we wish to repeat the instruction set.

Here's a simple example. Suppose you want to define a string A$ to use in a program printout that merely produces a double line across a 132-column page. Such a line would be useful in a table of data to separate the body of the table from the column headers at the top of the page. The following program, with 133 program lines, could accomplish this task. At the end of this program segment, A$ would contain 132 = signs.

```
500 B$ = "="
501 A$ = B$
502 A$ = A$ + B$
503 A$ = A$ + B$
504 A$ = A$ + B$
:
:
632 A$ = A$ + B$
```

Notice in this example that the same operation, adding B$ (a single = sign) to the current value of A$, is carried out over and over again. Furthermore, we know exactly how many times the process must be repeated to achieve the final string of 132 = signs. This is all you need to know to set up a simple loop. The following program accomplishes the same task as above, but saves considerably in wear and tear on our typing fingers and patience (not to mention the savings in program memory).

```
500 B$ = "="
510 A$ =" "
```

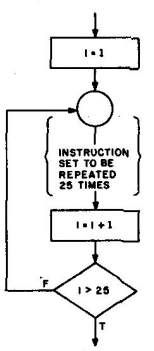



*Figure 1a. Traditional flowchart for a For/Next loop.*

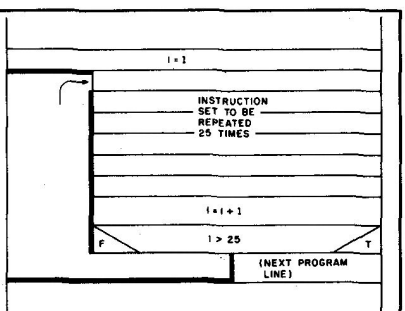



*Figure 1b. Structured Nassi-Shneiderman (or Chapin) diagram for a For/Next loop.*

*Address correspondence to Dan Bishop, Custom Comp, PO Box 429, Buena Vista, CO 81211.*

```
520 I = 1
530 A$ = A$ + B$
540 I = I + 1
550 IF I <= 132 THEN GOTO 530
560 ..... etc
```

Reducing 132 program lines to six makes programming a lot easier.

Take note in the above example of the following elements. In lines 500 and 510, the variables used within the loop (lines 530 to 550) are initialized *before* the loop is encountered. In line 520, a variable is defined to serve as a loop counter, and it too is given an initial value. The loop is then entered and the instruction set to be repeated (in this example, only line 530) is carried out.

Finally, at the end of the loop, two things occur. The counter is incremented the desired amount, and its new value is compared with the specified maximum value to determine whether to repeat the loop or go on with the rest of the program.

Basic provides a unique command that further simplifies this type of task. **The For/Next/Step commands take care of all of the bookkeeping** and comparisons automatically. The above example would look like this if the For/Next/Step commands were to be included.

```
500 B$ = "="
510 A$ = " "
520 FOR I = 1 TO 132 STEP 1
530       A$ = A$ + B$
540 NEXT I
550 ..... etc
```

As before, the variables A$ and B$ are initialized before the loop is encountered. But the first command within the loop, line 520, does four things in one command line. Line 520 defines the variable to use for a loop counter (I), the initial value that I should have (1), the maximum value I should obtain before leaving the looping process (132), and the increment that should be given to I each time the loop is processed (STEP 1).

Following this is the instruction set that defines the repetitive operations to be carried out (line 530). The end of the loop is signified by line 540, NEXT I, which, as far as the computer is concerned, is the equivalent of lines 540 and 550 in the previous example. Both examples would have the same flowchart.

```
10  HOME
20  GR
30  FOR H = 0 TO 39
40    GOSUB 100
50  NEXT H
60  FOR H = 39 TO 0 STEP - 1
70    GOSUB 100
80  NEXT H
90  GOTO 30
100 COLOR = 13
110 PLOT H, 12
120 COLOR = 0
130 PLOT H, 12
140 RETURN
```

*Listing 1.*
*Demo program.*

Careful study of these diagrams will bring to light one interesting feature of the For/Next operation. The comparison is made when the Next instruction is encountered. This means that the instructions within the loop will always be carried out at least once, even if the loop counter is already out of the range specified by the limits.

If the Step instruction is omitted from the For/Next loop, the computer will automatically assume that you want it to be 1 and will increment the loop counter by one for each pass through the loop. It is also not necessary to specify the variable after the Next statement, but in doing so you can prevent some serious problems in more complex situations. In choosing a variable to use as a loop counter, you must use a real variable name; attempts to use an integer or string variable name (I% or I$) will result in an error. The values used to specify the range through which the loop counter is to operate may be integers, real numbers (with decimal fractions), variable names, or mathematical expressions that evaluate to an appropriate numeric value.

In some cases, it will be desirable to run through a loop in which the loop counter is initialized at a maximum value and decremented to a minimum value. The format for the command is the same as above; the only difference is that the Step function is expressed as a negative, and the loop is continued until the value of the loop counter is less than the minimum limitation set in the For statement. Such a command might look like this:

```
FOR JJ = 233 TO 18 STEP - 3
```

Quite frequently, the value of the loop counter at any particular pass through the loop will be important in the loop operations as well. Listing 1, which moves a yellow spot back and forth across the screen, demonstrates this.

Since the horizontal cursor position limits set by the Apple are 0 to 39, these two limits are used to define the loops in lines 30 and 60. Since the operation that is carried out is the same whether you're moving the dot from left to right (lines 30–50) or from right to left (lines 60–80), the four lines of instruction that actually display and erase the dot are written only once and used as a subroutine (lines 100–140).

Within each loop, the only instruction that occurs is a jump to the subroutine, and the Return statement sends the computer back to within the loop it jumped from. Notice that the loop variable, H, is used twice within the subroutine to specify the spot's current horizontal position.

More commonly, the loop variable finds itself used within the loop as a subscript for some array variable. For example, suppose you had 200 names stored in memory in the array NM$, from NM$(1) to NM$(200). In order to print a list of these names, you'd set up a simple loop and use the loop counter as the subscript. Each pass through the loop would result in the printing of the next name on the list, since the loop counter (and subscript) is different with each pass.

```
1500  FOR L = 1 TO 200
1510        PRINT L;". ";NM$(L)
1520  NEXT L
```

In this example, the loop counter is also used to number the names as they are printed. A sample of the resulting display (or printout) might look like this:

```
55. HARRY JONES
56. JOHN JACKSON
57. ANNE SIMMS
```

You might have noticed one other characteristic of the listings shown above. The entire set of instructions that appears within a loop (between the For statement and the Next statement) has been indented for clarity. This is common practice to aid in

```
 10  HOME
 20  DIM A3%(4,4,4)
 30  FOR I = 1 TO 4
 40        II = I*100
 50        FOR J = 1 TO 4
 60              JJ = J*10
 70              FOR K = 1 TO 4
 80                    A3%(I,J,K) = II + JJ + K
100             NEXT K
110       NEXT J
120 NEXT I
200 HOME
210 INPUT"VIEW WHICH PAGE? (0-4)...";P
220 IF P<0 OR P>4 THEN GOTO 200
230 IF P = 0 THEN GOTO 340
240 PRINT
250 FOR I = 1 TO 4
260       FOR J = 1 TO 4
270             PRINT A3%(I,J,P);"   ";
280       NEXT J
290       PRINT
300 NEXT I
310 PRINT
320 INPUT"PRESS <RETURN> TO CONTINUE...";X$
330 GOTO 200
340 END
```

*Listing 2.*
*Demo program using For/Next loops.*

reading computer listings, but is not at all necessary for the proper functioning of the program. In fact, the Apple will allow you to type in those spaces, but will ignore them as the instructions are sent to memory. When you subsequently list the program, the indentations will have disappeared.

### How to Get Out of a Loop

There are occasions when it is necessary to make a hasty premature exit from a loop. Suppose for instance that you're scanning through the list of 200 names, looking for SUZY HOPKINS. Once you have found that name, and know what value the subscript has for NM$(L) to correspond to SUZY HOPKINS, you want to proceed on with the next task. But you're trapped inside of a loop which, come hell or high water, is going to cycle through 200 comparisons. If L = 3, then that's 197 more cycles through the loop than needed.

What you can do, and what, unfortunately, is commonly done, is to simply jump out of the loop with a Goto statement:

```
IF NM$(L) = "SUZY HOPKINS" THEN GOTO 2000
```

The problem with this approach is that the computer will never realize that you have left the For/Next loop. Whenever the For instruction is encountered, the computer must set aside some memory space for bookkeeping. Among the items that it must keep track of are the address of the first instruction in the loop (so that it knows where to loop back to after each completed cycle), the current value of the loop variable, the maximum value for the loop variable, and the step value. If you don't complete the natural loop cycle, all of these values will remain in memory, cluttering the computer's mind. Eventually all of the memory reserved for keeping track of the For/Next loops will be filled and the program will crash with an OUT OF MEMORY error.

To avoid this problem, and neatly close the books on the current For/Next while escaping from its clutches at the same time, use a second variable to hold the loop variable's needed value, and then reassign the loop variable to the maximum value it would eventually achieve if left on its own. The following program sequence will illustrate this approach.

```
1600  FOR L  =  1 TO 200
1610        IF NM$(L) < > "SUZY
            HOPKINS" THEN GOTO 1650
1620              LL  =  L
1630              L  =  200
1650  NEXT L
```

In this example, when a match for SUZY HOPKINS has been found, the value that the loop variable (and subscript) has is assigned to the variable LL. Then the loop variable is set to the loop limit, 200, forcing the loop to end normally when line 1650 is next reached. At that point, the computer will clear all of the bookkeeping data for this particular loop off the memory stacks, and you need never worry about it again.

Some Basics have an instruction, such as POPN, which automatically clears a For/Next from the memory stack without having to follow the procedure recommended above, but this feature is not available in Applesoft.

### Nesting For/Next Loops

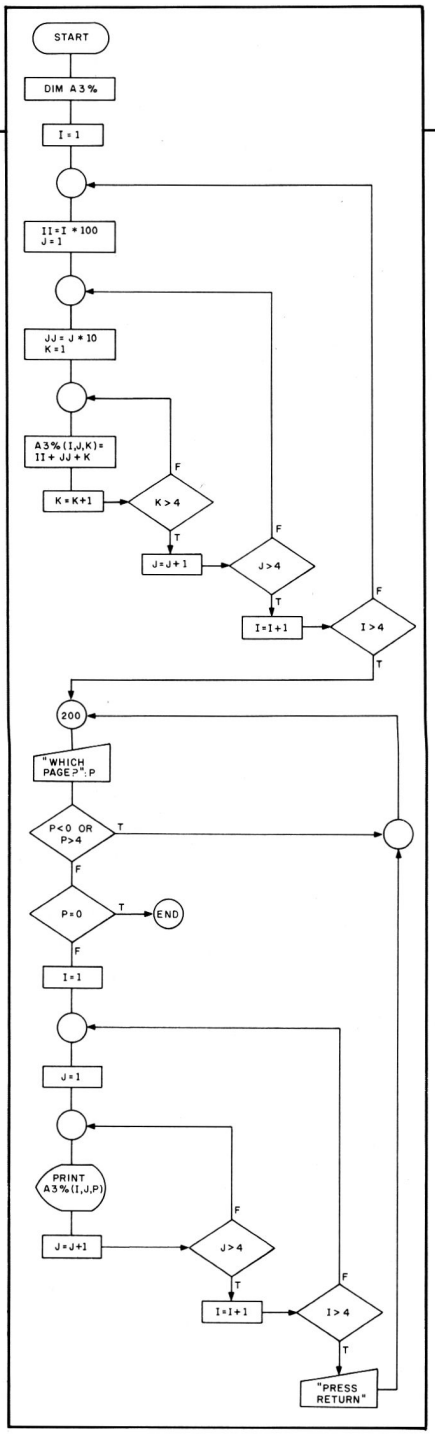
Frequent situations arise in which a loop must be constructed within another loop. This is called "nesting," and a case that involves only two loops is referred to as being nested "two deep." Different Basics have different limitations on how deep For/Next loops may be nested. For Applesoft Basic, you are allowed to nest 10 deep, which is probably more nesting than you will ever need.

The only rule that must be followed when nesting For/Next loops is that each loop must be entirely self-contained. No overlap of loops is allowed. What this means is that, if the innermost loop is using K as the loop counter, then the Next K instruction must come before any of the Next statements that close the other loops. If J is the outermost loop counter (that is, if FOR J = . . . TO . . . is the first For statement in the nested group to be encountered), then the Next J instruction must be the last Next relating to the nested group. Violation of this rule usually results in a NEXT WITHOUT FOR error.

The example in Listing 2 illustrates this feature. A three-dimensional array is set up having dimensions 4 × 4 and four "pages" deep. Then, using a nested For/Next group that is three levels deep, each element in the array is given a unique value based on the current values of the loop counters. In order to visualize what has happened, each two-dimensional page of the array can be displayed.

This program produces three-digit numbers in each of the array elements, with the first digit corre-

*Figure 2. Flowchart depicting the program which assigns unique values to the 64 elements in a three-dimensional array.*




sponding to the row number, the second digit corresponding to the column number, and the third digit to the page number. Note that lines 30–110 contain three nested loops, with each loop being closed with a Next in the reverse order in which it was introduced with the For statement. In this way, the loops are kept from overlapping. Figures 2 and 3 depict flowcharts for this program which clearly demonstrate this principle. The program could be simplified by combining lines 90–110 into the following instruction:

```
90 NEXT K, J, I
```

The order of appearance of the loop counters in such a combined statement is the same order that they would have if separate Next statements had been used.

### Read/Data/Restore

The simplest way to get information into the computer for the program to work with is to incorporate that information as part of the program itself. In that way, once the program has been loaded into the computer, so has the data that the program is to use. There is no need to worry about disk files, Field statements, random or sequential access, or the integrity of your data if using cassette files. Furthermore, the program can obtain the data much faster if the computer doesn't have to search cassette or disk files for the information.

The obvious disadvantage lies in the fact that it is more cumbersome to deal with additions or changes in the data set, especially if there is a lot of data to be entered. Since the data is actually part of the program, any alterations to the original data set must be made by someone who knows something about programming. In other words, using Data statements to store information within the program itself is the least "user friendly" approach to handling such information. This is no problem if it is your own program you are dealing with and the actual amount of information involved is limited.

When the computer encounters the Data statement within a program, it treats everything that follows the word DATA in that program line as program information; no processing instructions belong in that line so the computer skips that line and proceeds on to the next program line. More than one data element may be contained within a Data line, but each element must be separated from the others by a comma.

Literal data, or nonnumeric data, need not be enclosed within quotation marks in Applesoft, although this is not true for all Basic dialects. An exception occurs if one of the characters within the data element is a comma or if the element begins or ends with blank spaces. The following example of a Data statement illustrates these rules:

```
DATA 3.155, 12, MARY, JIM, "BOULDER, COLO.","  FIVE  "
```

You may use as many Data statements within a program as you desire. The computer will read the data elements sequentially from the first element that appears within the program to the last, regardless of where the Data statements are physically placed in the program. For example, two Data statements may be placed at the beginning of the program, one may appear in the middle, and five may show up at the end. The computer will still read the Data elements in proper sequence.

Although a program may have plenty of Data statements, unless the computer is told to read the data it will totally disregard the information. The Read instruction is used to accomplish this task. (At last! Something that makes sense.) The Read command must be followed by a variable name (such as A, X$, R1%, etc.) or a variable name list in which

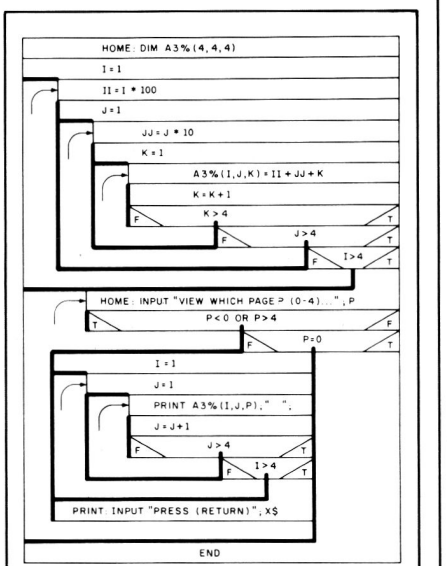



*Figure 3. Structured Nassi-Shneiderman diagram for the same program whose flowchart is shown in Figure 2.*

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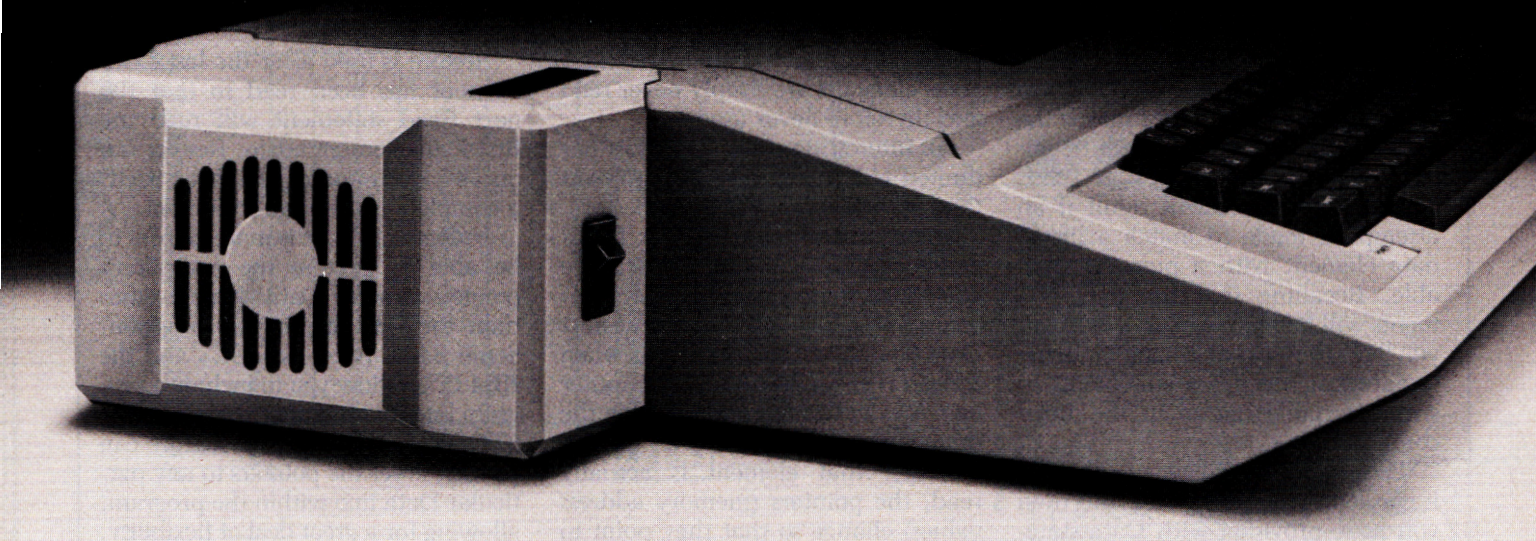

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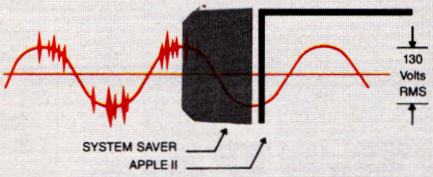


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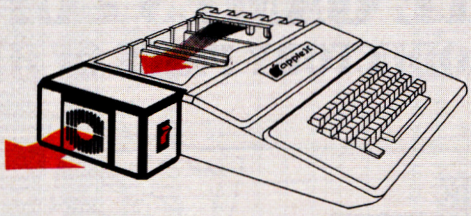

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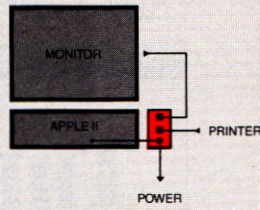


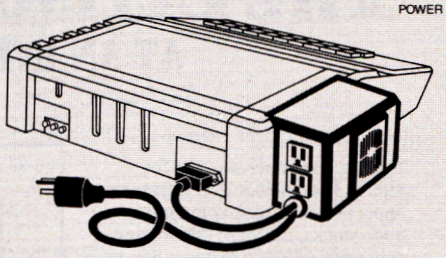

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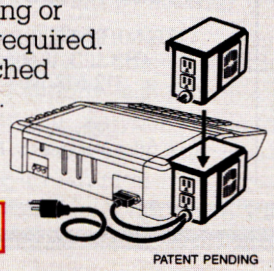

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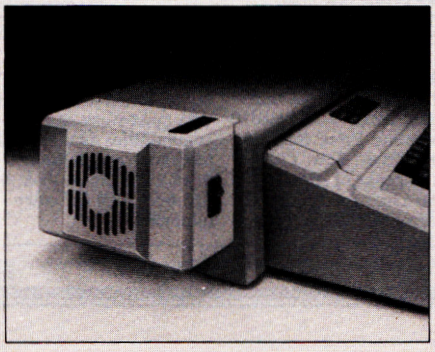

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the names are separated by commas.

The only restriction is that the variable name's type must match the type of information that will be encountered in the Data list. A TYPE MISMATCH error will result if an attempt is made to match a literal data element with a numeric variable. Recalling that the data elements will be read in exact sequence, you'll see that it's easy to match string variables in the Data statements to string variable names in the Read commands.

The computer will get very upset if it is asked to read more elements than you have provided with Data statements. An OUT OF DATA error will occur and your program will crash. Be sure that the number of Data elements included in your program equals or exceeds the number of Read variables your program uses. Of course, if there are more Data elements than Read variables, the extra Data elements are simply never read and therefore never used.

An interesting command of rather limited use as supplied by Applesoft (and several other Basics) is Restore. Whenever the computer uses Read/Data commands, it keeps track of the address of the memory location that contains the first character of the next Data element to be read. Thus when a Read is encountered, the computer knows exactly where to look for the desired Data element.

When that element is actually read, the pointers (memory address values) change so that they point to the next Data element in sequence, awaiting the next Read instruction. Restore merely resets these pointers so that they again point to the first Data element in the entire program. In this way, a set of Data may be read over and over again.

Restore is used after the last Data element has been read so that the next Read statement will read the first Data element again. Restore is a one-word command that is, by itself, a complete instruction statement.

Unfortunately, it is more helpful to be able to Restore the computer's pointers to some Data element other than the first one in the program. Some Basics (such as DEC's and the IBM PC's) allow you to include a program line number after the word RESTORE. In this way the Restore can be used to set the pointers to any particular Data line within the program, allowing for a great deal of flexibility.

To accomplish a partial Restore in Applesoft, you must be a little sneaky. First, identify which Data element(s) you may later wish to jump back to with this partial Restore. Then, just before the program is to read that Data element for the

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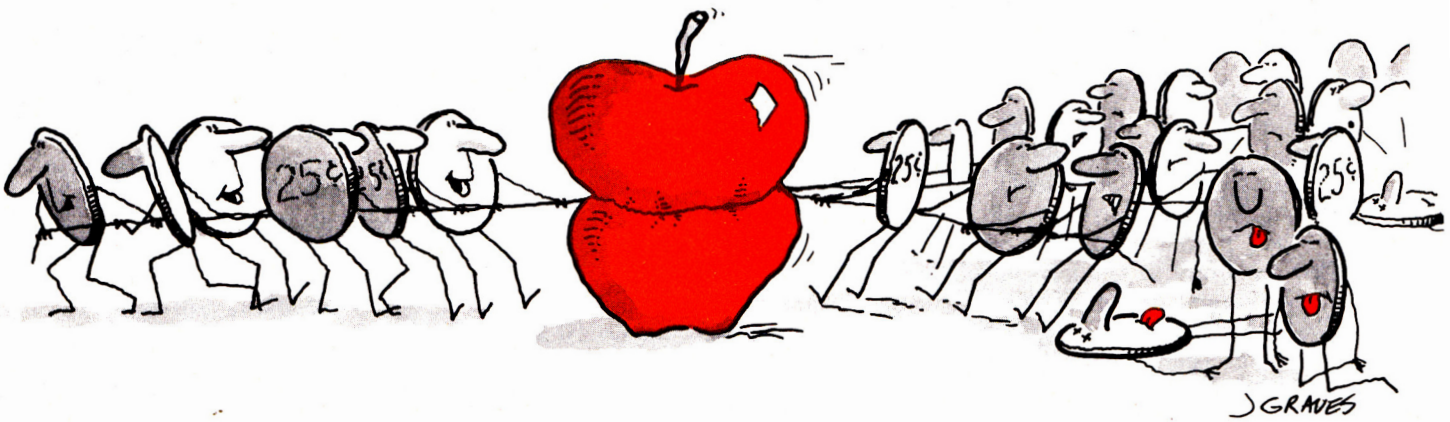


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first time, pry open the computer's memory and *peek* at the memory addresses contained in the Read/Data pointers at that instant; save those addresses for future reference.

Then, when it comes time to Restore back to that particular Data element, you can again pry the lid off the memory and *poke* those previously saved addresses back into the Read/Data pointer locations. The computer never suspects a thing (assuming the operation was a success) and the next Read command will read the desired Data element.

If you need to make several such partial Restores, it may be useful to set up a small array dedicated to storing the memory addresses to be used in each partial Restore operation. How to obtain these addresses is described in the next section, along with two useful Basic commands—Peek and Poke. These two commands are the programmer's scalpels, used to expose and alter portions of computer memory.

### Peeking and Poking Previous Peeks

With a PEEK(###), where ### is some number that represents a memory address within computer memory (RAM or ROM), you can find out exactly what byte value (0 to 255) is stored in location ###. In Command mode, you can do this with the complete instruction, PRINT PEEK (###). In order to see the sequence of codes between memory addresses 1 and 10000, try the following short program:

```
10  HOME
20  FOR I = 1 TO 10000
30        PRINT I, PEEK(I)
40  NEXT
```

In order to obtain the Read/Data pointers from RAM, you need to know the addresses within RAM where Basic stores this information. It turns out that four addresses must be *peeked* in order to obtain the current Data pointer address value. These addresses are 123, 124, 125 and 126.

The following line of Basic code will store the values currently contained in these addresses for future use in our partial Restore operation:

```
FOR P = 0 TO 3: P(P) = PEEK(123 + P): NEXT P
```

The four pointer addresses are stored in P(0), P(1), P(2) and P(3). This line of Basic code should be placed immediately prior to the Read statement in which the desired Data element is read. If your program is to have several partial Restore operations, you may wish to use a two-dimensional array, P(i,j), in which j refers to the specific Restore operation, and i ranges (as above) from 0 to 3.

Once the pointer addresses have

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```
10  REM   DATEBOOK PROGRAM
11  REM   BY DAN BISHOP
12  REM   CUSTOM COMP
13  REM
20  DIM P%(3,7)
30  FOR J = 1 TO 7
40  FOR I = 0 TO 3
50 P%(I,J) =  PEEK (123 + I)
60  NEXT I
70  READ D$,N
80  IF N = 0 THEN  GOTO 120
90  FOR K = 1 TO N
100  READ TM$,AP$
110  NEXT K
120  NEXT J
200  HOME
210  INPUT "WHAT DAY?  (1-7 FOR SUN-SAT; 0 TO END)";N%
220  IF N% < 0 OR N% > 7 THEN  GOTO 200
230  IF N% = 0 THEN  GOTO 9999
240  HOME
250  FOR I = 0 TO 3
260  POKE 123 + I,P%(I,N%)
270  NEXT I
280  READ D$,N
290  PRINT D$":  "N" APPOINTMENTS"
300  PRINT
310  IF N = 0 THEN  GOTO 360
320  FOR K = 1 TO N
330  READ TM$,AP$
340  PRINT ,TM$,AP$
350  NEXT K
360  PRINT
370  GOTO 210
1000  DATA SUNDAY
1001  DATA 0
2000  DATA  MONDAY
2001  DATA 0
3000  DATA  TUESDAY
3001  DATA  0
4000  DATA  WEDNESDAY
4001  DATA  0
5000  DATA  THURSDAY
5001  DATA  0
6000  DATA  FRIDAY
6001  DATA  0
7000  DATA  SATURDAY
7001  DATA  0
9999  HOME : END
```

*Listing 3.*
*Applesoft listing for a simple appointment calendar date book program.*

been saved (in the P(i) array), whenever you want to do a partial Restore back to that specific Data element, all you need do is *poke* the values saved in the P(i) array back into the appropriate RAM addresses, 123, 124, 125, and 126. This must be done just before you want to execute the Read statement for that data element. The following line of code handles this operation:

```
FOR P = 0 TO 3: POKE 123 + P, P(P):
NEXT P
```

The Poke command (which works only with RAM, of course) requires two arguments. The first is the RAM address into which you want to *poke* a specific value (0 to 255). This is followed by a comma, and then by the value to be *poked*. From this point on in the program, the Data elements will be read in sequence starting with Data elements that you chose to partially Restore to.

### Weekly Appointment Date Book

The short program shown in Listing 3 sets up a datebook for a single week. The actual appointments are entered as Data elements within the program, and are entered in pairs with the first element corresponding to the time of the appointment, the second to a description.

Each day of the week contains not only the day's name, but also the total number of appointments entered for that day. Consequently, every time a new appointment is entered into the date book, the appointment number for that day must also be updated in order for the program to function correctly.

A two-dimensional array is used to keep track of the Read/Data pointers for each Data element that corresponds to the beginning of a particular day's Data entries. Whenever a particular day is selected, the four pointers corresponding to that day are *poked* into memory so that the Read instructions will read only that day's information.

Although this program deals with a single week's appointments, you could, with a little imagination, expand it to encompass a longer period of time.

An alternative approach would be to save the program as Blank Calendar. Then, when an appointment needs to be entered into a week, load Blank Calendar, enter the data for the appointment (and change the number that represents the total number of appointments for that day), and then save the calendar program using the date range for the week as the program name.

For example, use SAVE OCT 5–11. Each week would be saved onto disk with a different name, available for immediate recall and use. Use RUN OCT 5–11 to view the calendar for that week. Use LOAD OCT 5–11 to load the program for inserting new appointments.

To add appointments to your calendar once the appropriate program has been loaded, type in LIST 1000, 1999 for Sunday, LIST 2000, 2999 for Monday, etc., for the particular day you need. Then enter a new Data line, which contains the time and description for your new appointment.

For example, if you make an appointment at 2:30 on Wednesday with the bank president to refinance your computer equipment, you'd do a LIST 4000, 4999. Now if you had two appointments already entered for that Wednesday, you might see something like the following:

```
4000  DATA WEDNESDAY
4001  DATA 2
```

4010 DATA 9.45, DENTAL CHECKUP
4020 DATA 4.15, IRS AUDIT

(Obviously, Wednesday is going to be a very bad day!) Since your 2:30 appointment comes between the 9:45 appointment and the disaster at 4:15, you would enter the new appointment by typing in line 4015 as follows:

4015 DATA 2.30, BANK PRES. FOR LOAN REFINANCE

Note that you must not use commas or colons in the Data statement. The time is therefore entered as a decimal number.

**You must also type in line 4001 to change the number of listed appointments from 2 to 3:**

4001 DATA 3

Now save the altered program, using the same name used before to load the program (unless, of course, this is the first appointment to be entered for the week). The appointment has been entered into your date book.

If you have occasion to delete an appointment, follow the same technique except that, instead of typing in a new line number followed by the appointment information, simply type in the line number to be removed and press return. That data line will be removed from the program. Of course, you must be sure to change the Data line listing the number of appointments for that day.

To edit the information in a Data line, it is simplest to retype the line with the corrected information. If you are familiar with Applesoft editing techniques, use those procedures. In this case, since you are neither adding an appointment nor deleting one, the "number of appointments" Data element does not need to be changed.

To use the program, simply do a Catalog command to view all the available programs on the disk (each program corresponding to a week). Select the desired week, and enter:

RUN week name

to run the program for that particular week. You will be asked to enter a number from 1–7 to select which day you wish to view, and on doing so, all of the appointments for that day will be displayed on the screen.

As for the program itself, line 20 dimensions the array in which the Read/Data pointers are to be kept, and lines 30–120 determine what those pointers should be and stores them into the appropriate array elements.

Elements P%(0,1)–P%(3,1) are determined immediately, before any Read instruction. These hold the pointers for your first Data sequence

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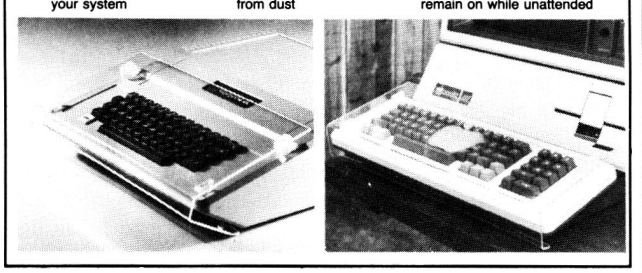

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corresponding to Sunday in your Data list.

Then read the day, D$, and the number of appointments currently entered for that day, N. If N is zero, then the next Data element will correspond to Monday's sequence, and these pointers will be stored in array elements P%(0,2)–P%(3,2). That is, the program will loop back to line 30 and pass through the loop again, with J = 2.

On the other hand, if appointments are listed for Sunday, then the program must read through those appointments until it gets to Monday's data before it can save Monday's pointers. Lines 90–110 take care of this.

Nothing is done with the information being read at this time. The only purpose for this sequence is to find pointer values for each of the seven days of the week.

Once your pointers have been stored in the P% array, the screen clears (line 200) and you're confronted with the prompt to enter a number (1–7) for the desired day. When you have done this, the appropriate pointers are *poked* into memory to set the Read/Data sequence to the desired spot in your list of Data elements.

The day, D$, and the number of appointments, N, are Read and displayed, and then all of the appointments for that day are successively read and displayed. Finally, the program loops back to prompt you to again enter a number between 1 and 7 for the desired day, allowing you to view another day in that particular week.

### Conclusion

The For/Next construction is an awesome Basic command that releases the power of the computer. The Read/Data instruction set provides a convenient means of organizing data input into a program. Although it is more commonly used for data that does not have to be altered frequently through successive uses, Read/Data does allow a simple program to handle some basic database management problems, such as keeping a simple record or date book, or setting up simple quiz programs, in which the Data statements contain paired elements consisting of a question and its correct answer.

Next month, I will describe the If/Then statement, subroutines, the Gosub/Return and POP commands, and the notorious Goto command. In the meantime, keep those cards and letters coming! I have a round file beside my desk for all that hate mail and a square file for all the rest. Let's keep 'em both full! ■

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```
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```

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# Fudge It!

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# Hplot Shapes Made Easy

At the end of last month's column, I promised to continue with some routines to accompany the Convert to Vector Shape program I'd just presented. These are two machine language routines with which to BLoad and display on screen block and Hplot shape tables.

First I'll get a couple of preliminaries out of the way. To be able to save these routines you must input CALL-151 and 800: before you start typing them in. Then, to be able to run them you must POKE103,1: POKE104,64: POKE16384,0 in the disk's Hello program during booting.

```
*800.88B

0800- A0 09 A6 07 CA E0 00 F0
0808- 04 C8 4C 04 08 98 85 FB
0810- A9 00 85 FA A5 FD 85 06
0818- A2 00 A0 00 20 11 F4 A4
0820- FE A2 00 B1 26 81 FA 88
0828- 18 E6 FA D0 02 E6 FB C0
0830- FF F0 04 C4 FF B0 EC C6
0838- 06 A5 06 C9 FF F0 04 C5
0840- FC B0 D5 60 A0 09 A6 07
0848- CA E0 00 F0 04 C8 4C 48
0850- 08 98 85 FB A9 00 85 FA
0858- A5 FD 85 06 A2 00 A0 00
0860- 20 11 F4 A4 FE A2 00 A1
0868- FA 51 26 91 26 88 18 E6
0870- FA D0 02 E6 FB C0 FF F0
0878- 04 C4 FF B0 EA C6 06 A5
0880- 06 C9 FF F0 04 C5 FC B0
0888- D3 60 00 00
*
```

*Listing 1. Test Tb, the block shape routine.*

```
*800.852

0800- A0 09 A6 50 52 00 00 00
0808- 00 00 4C 04 08 98 85 FB
0810- A9 00 85 FA A1 FA 85 06
0818- E6 FA A1 FA 85 08 E6 FA
0820- A1 FA AB E6 FA A1 FA A6
0828- 08 20 57 F4 C6 06 20 39
0830- 08 20 3A F5 C6 06 D0 F6
0838- 60 A2 00 E6 FA A1 FA 85
0840- 09 E6 FA A1 FA 85 08 E6
0848- FA A1 FA A8 A6 08 A5 09
0850- 60 00 85
*
```

*Listing 2. Test O (Call2048), the Hplot routine.*

The block shape routine, called TestTb, appears in Listing 1. To save it after entering it into the machine type BSAVE TESTTB,A2048,L140. The A and L refer to address and length, respectively.

You will find Test O (Call2048), the Hplot routine, in Listing 2. It is saved by typing BSAVE TEST O (CALL2048),A2048,L82.

TestTb enables you to Xdraw or (after two pokes) draw block shapes from tables and, in addition, to scan areas of the hi-res screen and create block shapes. A block shape table consists of raw screen bytes stored in tabular form. A block shape is a hi-res screen display of the shape bytes in the positions relative to each other they had when the shape was created, but not necessarily at the original screen coordinates. We'll discuss block shapes more next month.

### Hplot Shapes

An Hplot shape contains no raw screen bytes. It consists of two things: in the first byte, the number of coordinate sets the shape includes, and then, in groups of three, the coordinate sets themselves. Let's look at a triangular Hplot shape:

```
*900:04 7A 00 21 5A 00 9F 9A 00 9F 7A 00 21
```

This shape data appears as it would if you had just typed it into the Apple monitor (after first doing a CALL-151 to access the monitor). Notice there are four points in the triangle, but points one and four are both 7A 00 21. Obviously, we're dealing with a closed figure with the beginning and the end identical. When Test O (Call2048) processes this shape, it will see there are four points and draw a line from point three to point four (which is the same as point one).

Why the 00 bytes? Why three sets of numbers when all we're after are the X (horizontal) and Y (vertical) coordinates of the points? Because the X coordinate takes two bytes to represent. The Apple's hi-res screen has a 280 by 192 resolution where X can be from 0 to 279 and Y can be from 0 to 191. Numbers of 256 or more require two bytes. If you used only nine tenths of the screen horizontally you could limit X coordinates to 1 byte by keeping them under 256. Many sprite-based shape systems use only under-256 X coordinates for faster routines and a one third smaller coordinate set memory requirement. (See last month's column for a bit more on sprites.)

Getting back to Test O (Call2048), this routine reads the first byte as the number of coordinate sets to expect, and sets a counter in location $6 equal to this number. Then it goes through the shape, reading coordinates and plotting lines from the first point to the second, the second to the third, and so on. The routine decrements (subtracts) by one the data in the counter ($6) after each point has been plotted. When the counter hits 0, the shape is finished.

### Source Code

Refer to Listing 3 for the assembly source code for the Test O (Call2048) routine, created using Lisa. Temporarily skipping everything up to line 19, notice that we load the accumulator with the number-of-points data found at the base address BASL and then store the accumulator's data into $6 in line 20. (I could have called $6 COUNTR so others would understand my routine better.) Lines 21–29 load the necessary registers and tem-

*Address correspondence to Don Fudge at Avant-Garde Creations, PO Box 30160, Eugene, OR 97403.*

porary data holders (TEMPX) with the very first coordinate set's bytes. Line 30 runs the Hplot routine of Applesoft. It's the last time we'll need it, because from now on we'll draw lines only—something we could never do unless we first established a starting point.

Then we decrement the $6 counter in line 32 and run Applesoft's Hline routine in line 33, drawing a line from the last point plotted (or Hlined) to the new point loaded in the registers. By remembering the last point plotted and having the newest point loaded into its registers (the X and Y registers and the accumulator), Hline can always keep its line-drawing straight.

Line 34 decrements the counter again, since we've just used up two points in drawing that first line, and line 35 checks to see if the counter is 0 yet. BNE means branch if the result of the last operation (in this case decrementing $6) is not equal to 0. BNE branches us back to 32 (labelled HL), and we keep making this loop until $6 is 0. Then we bypass line 35, and line 36 returns us to the program we came from before running Test O (Call2048). (In line 2010 of last month's Convert to Vector Shape program we CALL 2048 to run this routine. The routine's RTS in line 36 returns us to the program's line 2010, where we meet a return, since lines 2000–2010 are a subroutine from line 46.)

Back at the beginning of Test O (Call2048), lines 1–7 label subroutines and data storage addresses for later use. Lines 8–18 are devoted to shape number resolution, set up as follows.

Routines such as TestTb (see last month's column and also next month's) and Test O (Call2048) reside between $800 and $8FF, so I start shape tables at $900, with possible extension up to $1FFF. (The next byte, $2000, is where hi-res page 1 starts.) I call a shape starting at $900 shape number 1, a shape starting at $A00 number 2—extending up to a shape number 23 that starts at $1F00. Since each $100 of memory is 256 bytes, each Hplot shape may be 256 bytes long. This is room for 84 coordinate sets, but you'll rarely need that many.

If you desired an Hplot shape with even more coordinate sets you could fit 255 of them in $300 (768) bytes with a couple of bytes to spare. In this case, there would be no shape two or shape three, but only shape one and shape four, and so on. Incidentally, with my methods block shape number resolution (next month) has the same $900–$1FFF set-up, but no lim-

```
]LIST    1 HGR        EQU $F3E2
   2 HPLOT           EQU $F457
   3 HLINE           EQU $F53A
   4 TEMPA           EPZ $9
   5 TEMPX           EPZ $8
   6 BASL            EPZ $FA
   7 BASH            EPZ $FB
   8                 LDY #$9
   9                 LDX $7
  10 HERE2           DEX
  11                 CPX #$0
  12                 BEQ THERE2
  13                 INY
  14                 JMP HERE2
  15 THERE2          TYA
  16                 STA BASH
  17                 LDA #$0
  18                 STA BASL
  19                 LDA (BASL,X)
  20                 STA $6
  21                 INC BASL
  22                 LDA (BASL,X)
  23                 STA TEMPX
  24                 INC BASL
  25                 LDA (BASL,X)
  26                 TAY
  27                 INC BASL
  28                 LDA (BASL,X)
  29                 LDX TEMPX
  30                 JSR HPLOT
  31                 DEC $6
  32 HL              JSR SUB1
  33                 JSR HLINE
  34                 DEC $6
  35                 BNE HL
  36                 RTS
  37 SUB1            LDX #$0
  38                 INC BASL
  39                 LDA (BASL,X)
  40                 STA TEMPA
  41                 INC BASL
  42                 LDA (BASL,X)
  43                 STA TEMPX
  44                 INC BASL
  45                 LDA (BASL,X)
  46                 TAY
  47                 LDX TEMPX
  48                 LDA TEMPA
  49                 RTS
  50                 BRK
  51                 BRK
  52                 END
```

*Listing 3. Test O (Call2048) source file.*


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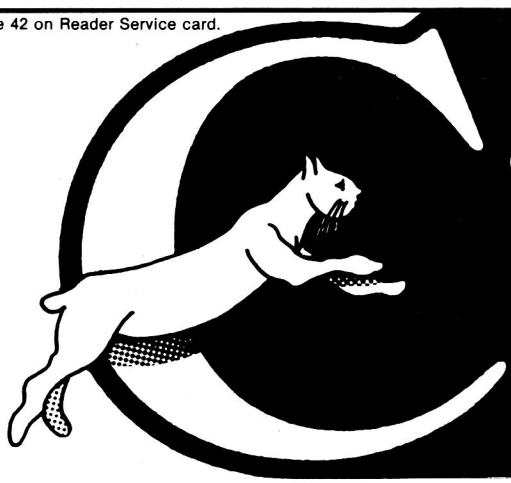

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**"For people who do adventure games, a special type of Hplot shape routine is needed."**

it (except 5888 bytes in one shape, perhaps) on shape length.

I set up this shape number resolving scheme for ease of operation. To create tables full of shapes you need only POKE 7, SHAPE NUMBER to tell your Apple which shape you want. Let's see how this works now.

In line 8 we stick a 9 into the Y register to hold the shape address high byte. Line 9 gets the shape number (previously poked into $7) and puts it into the X register (LDX means load the X register). Line 10 decrements X, our shape number counter for indexing, then 11 compares X to 0. If X is 0, our shape number is 1 and we branch to line 15. If it's not 0, our shape number is greater than 1, so we increment Y in 13 and jump back to line 10, as specified in line 14.

The code would be transportable and slightly faster if BNE were used in line 14, but it would also be more confusing for a novice to understand. Also, line 11 could be omitted, because BEQ automatically compares the last result to 0. But I left these lines alone because they add up to exactly three excess bytes of unneeded code, just room for a JSR to be inserted later. (JMP equals 3 bytes, BNE equals 2 bytes, CPX equals 2 bytes and JSR equals 3 bytes. JMP minus BNE equals one excess byte, and CPX minus CPX equals two excess bytes.) The reason I might want a JSR (equivalent of Gosub in Basic) is that shapes are often around 28 bytes long, but I allot each 256 bytes. A routine to JSR to, for allowing 4–8 shapes per page of memory (a page equaling $100), might be necessary in the future for memory economy.

Now, incrementing Y in line 13 means the shapes' high byte starting address goes from $900 (start) to $A00 to $B00 to $C00, and so on, up to $1F00. The higher the number originally poked in $7, the greater the high byte of the Hplot shape starting address. This is because line 14 keeps jumping back to line 10 until line 12, discovering a 0 in the X register, sends us to lines 15 and 16, where the permanent shape starting address high byte gets stuck into BASH (base address high byte). In 17 and 18 we put 0 into the low byte, since we're starting at even pages ($900, $A00, and so on). If we were having four or eight shapes per page, we'd omit these lines or resolve the correct low byte here.

### For Adventurers

This shape number resolution system is simple and fast, but many other systems are possible. Many types of Hplot shape drawing routines, such as animate, draw, edit and examine, are available in Avant-Garde's Hi-Res Secrets program. But for people who do adventure games, a special type of Hplot shape routine is needed—one that loads in a file and reads it and then creates a long series of Hplot shapes, according to the data read. Here's the basic outline of how this works:

(1) BLoad the shape set.
(2) Run the shape data through an algorithm that first reads the number of shapes.
(3) The algorithm reads the number of points between which to draw lines in shape number 1.
(4) It draws shape number 1 via the Hplot Shape Drawing routine.
(5) Steps 3 and 4 are repeated as many times as there are Hplot shapes.

### Color-Filling

However, the adventure game algorithm can't stop here. It needs to run color-fill routines to paint the line drawing scene just created. (Avant-Garde's Paint Master Scene Utility System contains all this and more.)

Here's a mock scene file, so you can see how a file for color-fill scenes is constructed. (A simple scene with line drawings and color-fill data takes three disk sectors, while a complex one might take up to five sectors. Compare that to normal 33–34 sector binary screen pictures!)

```
03 04 A1 00 09 03 01 09 01 00 9F A1 00 09
04 45 00 85 98 00 85 98 00 00 45 00 85
04 17 00 A7 29 00 A7 29 00 B9 17 00 A7
```

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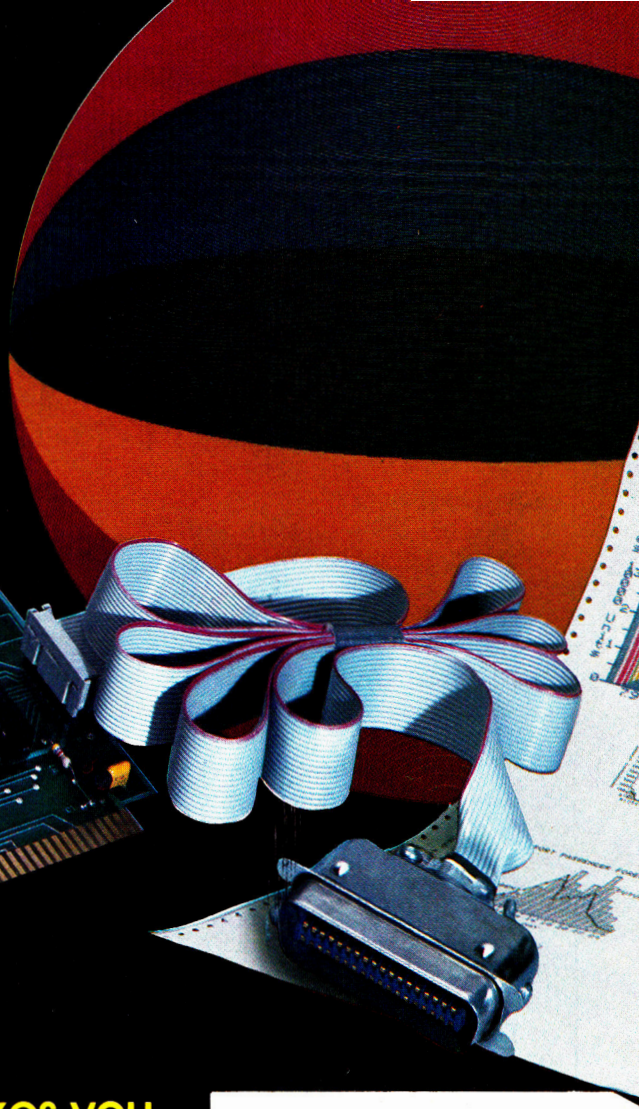

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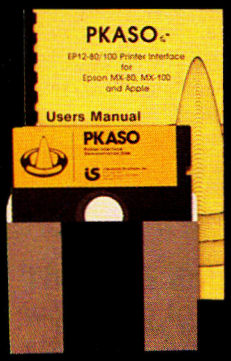


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This completes three shapes with four points each, but the scene table must finish with color-fill data.

04 B7 00 91 08 05 01 07 C8 06 01 77 88 11 01 47 F8

To recap, in the first three lines we have the multiple-Hplot-shape line drawing segment of the scene file and in the fourth the color-fill data. Study the first line. Notice it starts with 03. That's the number of shapes the program can expect to find. Next comes 04, the number of points in the first shape, followed by four coordinate sets designating X low, X high and Y. Then, in the second line, 04 means shape number 2 has four points also. (All three of these shapes are triangles, but that doesn't mean you must necessarily draw triangles. For a new Avant-Garde package called Follow the Dots Coloring Book I drew dozens of pictures of everything under the sun—hills, trees, houses, flowers, people, roads, planets, and so on. All are Hplot shapes.)

The third line is like the second. The 04 means four points and it's followed by the point coordinate sets. The fourth line differs, however. Its first number designates the number of seed points—how many places at which you'll start the fill routine. Then comes all the necessary data for effecting four-color fills, each data set containing four elements (X low, X high, Y and the color table index byte).

The first three elements are obviously where you'll be doing the color fill. But what about the fourth number? What does "color table index byte" mean?

It means there's a table of 256 numbers stored from $C00 to $CFF and you'll index into this table ($C00,X) with the color table index byte in the X register. Or, in English, you'll add X to $C00 and go to the resulting address for color-byte data.

You will, of course, need a utility for creating your color table—a utility that contains color-byte data for 32 different colors by choosing among hundreds of colors and patterns. This will make it possible to have hundreds of different color tables for various games, adventures and art projects. (All these types of utilities and tables are available in Paint Master Scene Utility.)

| Color | Color Bytes | | | | Byte Values |
|---|---|---|---|---|---|
| (green) | 0001000 | 1000100 | 0100010 | 0010001 | (8,17,34,68) |
| | 0100010 | 0010001 | 0001000 | 1000100 | (34,68,8,17) |
| (light violet) | 1110111 | 0111011 | 1011101 | 1101110 | (110,93,59,119) |
| | 1011101 | 1101110 | 1110111 | 0111011 | (59,119,110,93) |
| (yellow-grey) | 1100110 | 0110011 | 0011001 | 1001100 | (51,102,76,25) |
| | 0011001 | 1001100 | 1100110 | 0110011 | (76,25,51,102) |

*Table 1. Hi-res color table bit patterns.*

```
10  HGR
11  POKE  - 16302,0
81  DATA 8,17,34,68,136,145,162,196,17,34,68,8,145,162,196,136,119,110,93,
    59,247,238,221,187,110,93,59,119,238,221,187,247,25,51,102,76,153,179
    ,230,204,51,102,76,25,179,230,204,153,42,85,42,85,170,213,170,213,85,
    42,85,42,213,170,213,170
82  DATA 127,127,127,127,255,255,255,255,0,0,0,0,128,128,128,128,34,68,8,1
    7,162,196,136,145,68,8,17,34,196,136,145,162,93,59,119,110,221,187,24
    7,238,59,119,110,93,187,247,238,221,102,76,25,51,230,204,153,179,76,2
    5,51,102,204,153,179,230
83  DATA 1,21,1,22,2,21,2,22,1,5,1,6,2,5,2,6,1,13,1,14,1,15,1,16,1,17,1,19
    ,2,13,2,14,2,15,2,16,2,17,2,19,3,23,3,24,4,23,4,24,3,7,3,8,4,7,4,8,3,
    13,3,14,3,15,3,16,3,17,3,19
84  DATA 4,13,4,14,4,15,4,16,4,17,4,19,5,25,5,26,6,25,6,26,5,13,5,14,5,15,
    5,16,5,17,5,19,6,13,6,14,6,15,6,16,6,17,6,19,7,27,7,28,8,27,8,28,7,13
    ,7,14,7,15,7,16,7,17,7,19,8,13,8,14
85  DATA 8,15,8,16,8,17,8,19,9,29,9,30,10,29,10,30,9,13,9,14,9,15,9,16,9,1
    7,9,19,10,13,10,14,10,15,10,16,10,17,10,19,11,31,11,32,12,31,12,32,11
    ,13,11,14,11,15,11,16,11,17,11,19,12,13,12,14,12,15,12,16,12,17,12,19

86  DATA  5,6,6,7,7,8,5,7,5,8,6,8,5,5,6,6,7,7,8,8,13,13,13,14,13,15,13,16,
    13,17,13,19,14,14,14,15,14,16,14,18,14,20,  15,15,15,16,15,17,15,19,16
    ,16,16,18,16,20,17,17,17,19,19,19,2,2
87  DATA 1,1,3,3,4,4,28,27
88  DIM C1(33),C2(33),C3(33),C4(33)
90  FOR A = 1 TO 32: READ C1(A),C2(A),C3(A),C4(A): NEXT
100  DIM B1(141),B2(141)
110  FOR A = 1 TO 140: READ B1(A),B2(A): NEXT
115  HCOLOR= 0
116 N = 1
117  FOR X = 0 TO 36 STEP 4
120  FOR Y = 0 TO 179 STEP 13
130  FOR A = 0 TO 10 STEP 2
135 I = B1(N):J = B2(N)
140  HPLOT 279,Y + A:AD =  PEEK (38) +  PEEK (39) * 256 + X
160  POKE AD,C1(I): POKE AD + 1,C2(I): POKE AD + 2,C3(I): POKE AD + 3,C4(I
     )
162  HPLOT 279,Y + A + 1:AD =  PEEK (38) +  PEEK (39) * 256 + X
165  POKE AD,C1(J): POKE AD + 1,C2(J): POKE AD + 2,C3(J): POKE AD + 3,C4(J
     )
168  NEXT
170 N = N + 1
180  NEXT : NEXT
```

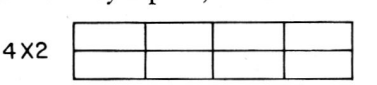
*Listing 4. Hi-res color demonstration.*

The reason there are exactly 32 colors is that each color needs 8 bytes for definition and 8 times 32 equals 256, which is one page—the limit I've given to color tables.

### Hi-Res Color Formation

You're probably eager to find out how those 8 bytes translate into state-of-the-art hi-res colors. Well, here goes.

For each color in the color table the color bytes are laid down in a kind of 4 by 2 pixel, like so:




This format is followed all the way through a scene, filling the 4-byte wide by 2-line tall pixel of color up to a line barrier, then filling in a different direction. This continues until the routine has done the best it can to fill any bordered enclosure with the chosen color. For a clearer understanding of these color bytes notice the bit patterns in Table 1.

Remember that a normal color pixel is 2 bits horizontal to each other.

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*Listing 5. Hplot shape drawing.*

```
0  ONERR  GOTO 63990
1  PRINT  CHR$ (4);"BLOADTEST 0 (CALL2048)": GOSUB 2500: GOTO 600
47  POKE  - 16303,0: POKE  - 16298,0: HOME : VTAB 1: PRINT "USE THE PADDLE
    S TO MOVE THE DOT UNTIL  YOU'RE AT YOUR STARTING POINT. HIT THE  BUT
    TON ON PADDLE #0. NOW MOVE THE DOT  UNTIL A LINE DRAWN BETWEEN THIS
    DOT &  THE 1ST DOT WOULD BE THE LINE
48  PRINT "YOU DESIRE. HIT BUTTON #0 AGAIN. KEEP UPTHIS PROCESS UNTIL DONE
    . AFTER THE LAST LINE HAS BEEN DRAWN, HIT NOT ONLY PADDLEBUTTON #0 BU
    T BUTTON #1 AS WELL. STAY  UNDER 85 POINTS OR 84 LINES.": GOSUB 6300
    0
49  GOSUB 188: POKE  - 16304,0: POKE  - 16297,0
50  HOME :P1 =  PDL (1): IF P1 > 150 THEN 50
51  ROT= 64: HCOLOR= H: SCALE= 1:FL = 0:SG = 0:V = (256 * (SHN + 8))
55 PO =  PDL (0): XDRAW 1 AT PO,P1:X% = PO:Y% = P1
60 P1 =  PDL (1): IF P1 > 159 THEN 60
61 PK =  PEEK ( - 16384): IF PK > 127 THEN V = V - 3: POKE  - 16368,0: IF
    PK = 160 THEN  HCOLOR= 0: GOSUB 950: HPLOT ZO,Z1 TO Z2,Z3: HCOLOR= H:
     GOSUB 62000:X% = ZO:Y% = Z1:ZO = Z2:Z1 = Z3: GOTO 970
62  IF PK = 193 THEN PK = 0: CALL 62450: GOTO 50
65  FOR QW = 1 TO 200: NEXT : HOME : VTAB 21: PRINT "X: "PO: PRINT "Y: "P1

67 LN =  INT ((V - (256 * (SHN + 8))) / 3) - 1
68  PRINT "LINES: "LN"  "
70 PO =  PDL (0): XDRAW 1 AT X%,Y%: XDRAW 1 AT PO,P1:X% = PO:Y% = P1
75  VTAB 1
80 BO =  PEEK ( - 16287): IF BO > 127 THEN  PRINT  CHR$ (7):V = V + 1: POKE
    V, PEEK (224):V = V + 1: POKE V, PEEK (225):V = V + 1: POKE V, PEEK (
    226): IF FL = 0 THEN FL = 1:BO = 0:Z1 = P1:ZO = PO: XDRAW 1 AT PO,P1:
     GOTO 85
82  IF BO > 127 THEN  HPLOT X%,Y% TO ZO,Z1:BO = 0:Z3 = Z1:Z2 = ZO:Z1 = Y%:
    ZO = X%: IF ER = 1 THEN ER = 0: GOSUB 960
85 B1 =  PEEK ( - 16286): IF B1 > 127 AND (FL = 1 AND SG = 0) THEN SG = 1:
     HCOLOR= H: GOTO 110
90  GOTO 60
110  PRINT "":GG =  INT ((V - (256 * (SHN + 8))) / 3): POKE (256 * (SHN +
    8)),GG
115  REM  BETWEEN QUOTES IN 110 IS CTRL G
120  POKE  - 16303,0: POKE  - 16298,0
130  PRINT : INPUT "DO YOU WISH TO DRAW ANOTHER ONE? (Y/N):";AN$: IF  LEN
    (AN$) = 0 THEN 130
140  IF  ASC (AN$) = 89 THEN 49
187  GOTO 204
188  PRINT "TO ERASE LINE, HIT SPACE BAR.": PRINT "TO ERASE SHAPE, HIT A."
    : PRINT : PRINT : INPUT "HPLOT-SHAPE # YOU WILL DRAW NOW:";SHN: IF SH
    N > 23 OR SHN < 1 THEN 188
189  POKE 7,SHN
190  RETURN
204  HOME : VTAB 1
205  INPUT "GIVE THE SHAPE # YOU WANT ALL THE  SCANNED BYTES' DATA TO
     GO INTO; REMEMBERTHAT LONG SHAPES CAN'T START TOO NEAR  SHAPE # 23.
     THE TABLE WE'RE CREATING  WILL BE LESS THAN 24 SHAPES LONG & LESS
    THAN 5888 BYTES (1-23):";SHN
300 D$ =  CHR$ (4)
301  VTAB 21
302  INPUT "FILE NAME: ";N$: IF  LEN (N$) = 0 THEN 302
303  INPUT "DID YOU GET IT RIGHT? (Y/N):";Z$: IF  LEN (Z$) = 0 THEN 302
304  IF  ASC (Z$) <  > 89 THEN 302
307  TEXT : VTAB 1: HOME : GOSUB 5000
308 LL = (V + 1) - 2304
309 PL = 1 +  INT (LL / 256) - (SHN - 1)
310  PRINT D$"BSAVE";N$;",A2304,L";LL
312  PRINT "THIS SHAPE AND ALL THE SHAPES THAT CAME BEFORE IT TOOK UP "LL"
     BYTES.": PRINT "IT'S # "SHN" SO GIVE IT "PL" PLACES IN": PRINT "THE
    FILE. (HIT ANY KEY TO CONTINUE):": GOSUB 63010
400  GOTO 600
402  HOME : VTAB 1: INPUT "SHAPE TABLE NAME: ";STN$: IF  LEN (STN$) = 0 THEN
     600
403  INPUT "DID YOU GET IT RIGHT? (Y/N):";QW$: IF  LEN (QW$) = 0 THEN 402
404  IF  ASC (QW$) <  > 89 THEN 402
405 D$ =  CHR$ (4): PRINT D$"BLOAD";STN$: PRINT "ADDRESS: " PEEK (43634) +
     PEEK (43635) * 256: PRINT "LENGTH: " PEEK (43616) +  PEEK (43617) *
    256
406  INPUT "SHAPE #: ";SHN: POKE 7,SHN
407  POKE  - 16304,0: POKE  - 16297,0: HOME : VTAB 21
500  CALL 2048
510 BS = 1:VS = 0
525  HOME
530  VTAB 21: INPUT "DO YOU WANT ANOTHER SHAPE? (Y/N):";QW$: IF  LEN (QW$)
     = 0 THEN 530
540  IF  ASC (QW$) <  > 89 THEN  HOME : GOTO 550
545  GOTO 406
550  VTAB 21: GOSUB 63000
600  POKE  - 16303,0: POKE  - 16298,0: HOME : VTAB 1: INVERSE : HTAB 18: PRINT
     "MENU:": NORMAL
601 SG = 0:FL = 0:ZQ = 0
602  SCALE= S: HCOLOR= H: ROT= R
603  PRINT "(HIT ESC TO QUIT)": PRINT
605  PRINT "(0)ABORT SCREEN---START OVER": PRINT
620  PRINT "(1)CHOOSE AN HPLOT-SHAPE COLOR": PRINT
636  PRINT "(2)CHOOSE A BACKGROUND COLOR": PRINT
640  PRINT "(3)LOAD IN AN HPLOT-SHAPE": PRINT
650  PRINT "(4)DRAW HPLOT-SHAPE & SAVE IT": PRINT
660  PRINT "(5)VIEW SCREEN": PRINT
690  FLASH : PRINT "(CHOOSE 0-5):";: NORMAL : GET A$: PRINT  CHR$ (13)
692  IF  ASC (A$) = 27 THEN  TEXT : HOME : END
700  IF  LEN (A$) = 0 THEN 690
710  IF  VAL (A$) < 0 OR  VAL (A$) > 5 THEN 690
719  IF A$ = "0" THEN 912
720  ON  VAL (A$) GOTO 900,916,402,47,920
721  GOTO 600
900  HOME : VTAB 1: INPUT "SHAPE COLOR? (0-7):";H: IF H > 7 OR H < 0 THEN
     900
```

*Listing continued.*

Such a pixel can have four color possibilities: 00, 01, 10 and 11, which make black, green, violet and white, respectively, or Hcolors 0–3. By using every screen byte's high bit to signify a special color flag, Hcolors 4–7 become available. (5 is orange and 6 is blue, but 4 is only another black and 7 is only another white.)

In the bit patterns, only the seven visible bits are shown. The color bit is absent. But the byte values tell the story anyway. *Whenever a screen byte is greater than 127 in value, the color bit is on, while all values under 128 represent bytes with color bits off.*

Incidentally, whenever you put two or more color bytes with opposite color-bit settings next to each other horizontally, look out that neither spills into its neighbor, since a color bit affects all 7 bits of a screen byte. It's not possible to split orange and green colors in the same byte, nor violet and blue, nor violet and orange, nor green and blue. This phenomenon accounts for the color clashes occasionally seen in Apple pictures. To avoid this problem, have borders between clashing colors be at byte boundaries such as 7, 14, 21, 28. (Sprite shapes created with special types of graphics chips use no color bit and 8 bits per byte displayed to avoid such clashes.)

To go on, once you understand the 2-bit-per-color-pixel concept, you're ready to make sense out of the binary screen byte listings in the table. A normal green line would be 0 1 0 1 0 1 0 1 0 1 0 1 0 1. It could be longer or shorter, but it *must* have alternating off and on bits. The values of the bytes in a green line are 42, 85, 42, 85, 42, 85, and so on.

0 1 0 1 0 1 Green Byte
$32 + 8 + 2 = 42$

1 0 1 0 1 0 1 Green Byte
$64 + 16 + 4 + 1 = 85$

Don't forget that all screen bytes are displayed *backwards* relative to normal byte listings. Therefore a 1110000 byte will look like 0000111 on screen.

You know about a normal green line now, so what about a line that alternates green and black pixels?

Will such an arrangement create a dark green color (black plus green equals dark green)? No, because once you stack these lines on top of each other vertically, you'll get vertical green bars, not a dark green. However, it turns out that all you really need is a black/green alternation scheme in both horizontal and vertical directions—like this:

00 01 00 01
01 00 01 00
00 01 00 01
01 00 01 00

The minimum successful pixel configuration appears in the 4 by 2 pixel listings a few paragraphs back. Such a wide pixel is needed because, while a 4-bit by 2-line pixel is all that's required to create the proper color, in practice the only way to repeat such a pixel over and over is to use 4 bytes rather than bits (4 bits times 7 visible dots per byte equals 28 bits equals 4 bytes). If that seems confusing, it's discussed in more depth in Avant-Garde's Hi-Res Secrets Graphics Applications System.

*Listing continued.*

```
902  GOTO 600
912  INPUT "SURE YOU WANT TO ABORT SCREEN? (Y/N):";QW$: IF  LEN (QW$) = 0 THEN
     912
913  IF  ASC (QW$) <  > 89 THEN 600
914  HGR : GOTO 600
916  INPUT "SURE YOU WANT TO DO A BACKGROUND COLOR? THIS WILL ERASE ANY SH
     APE! (Y/N):";QW$: IF  LEN (QW$) = 0 THEN 916
917  IF  ASC (QW$) <  > 89 THEN 600
918  HOME : VTAB 1: INPUT "BACKGROUND COLOR (THIS ERASES SHAPES!)  (1-7):"
     ;BC: IF BC > 7 OR BC < 0 THEN 918
919  POKE  - 16304,0: POKE  - 16297,0: HCOLOR= BC: HPLOT 0,0: CALL 62454: VTAB
     21: GOSUB 63000: GOTO 600
920  POKE  - 16304,0: POKE  - 16297,0: VTAB 21: GOSUB 63000: GOTO 600
950 E0 = Z0:E1 = Z1:ER = 1: RETURN
960  HCOLOR= 0: FOR Q = E1 - 1 TO E1 + 1: FOR W = E0 - 1 TO E0 + 1: HPLOT
     W,Q: NEXT : NEXT : HCOLOR= H: RETURN
970  HCOLOR= 0: HPLOT Z0,Z1 TO Z2,Z3: HCOLOR= H: GOTO 60
2500  POKE 2296,1: POKE 2297,0: POKE 2298,4: POKE 2299,0: POKE 2300,4: POKE
     2301,0
2505  POKE 232,248: POKE 233,8
2510  HCOLOR= 3:H = 3: POKE  - 16301,0
2511  POKE  - 16303,0: POKE  - 16298,0: INVERSE : PRINT "IF YOU ENTERED TH
     IS PROGRAM WITH SOME-  THING ON THE HI-RES SCREEN YOU WANTED TOSAVE,
     HIT THE SPACE BAR NOW---          OTHERWISE HIT ANY KEY EXCEPT THE SP
     ACE  BAR.": NORMAL
2512 PK =  PEEK ( - 16384): IF PK > 127 THEN  POKE  - 16368,0: GOTO 2514
2513  GOTO 2512
2514  IF PK = 160 THEN 2520
2515  HGR
2520  RETURN
5000  PRINT "WOULD YOU LIKE TO GIVE THE # OF SHAPES  IN YOUR TABLE & HAVE
     THIS PROGRAM GIVE  EACH SHAPE 256 BYTES OF ROOM, OR WOULD  YOU RATHER
      LET THE LAST SHAPE # YOU      ENTERED BE THE LAST SHAPE IN THE TABLE
      YOU'LL SAVE NOW?": PRINT
5010  PRINT "(THE MAXIMUM SHAPES IS 23 AND THE MAXI- MUM BYTES IS 5888. IF
      ANY OF YOUR SHAPESWERE OVER 256 BYTES LONG, THEY COUNT AS 2 SHAPES.
     OVER 512 COUNTS AS 3, ETC.)": PRINT
5020  PRINT "(1)GIVE # OF SHAPES": PRINT "(2)LAST SHAPE # GIVEN CAN BE LAS
     T ONE IN   THE TABLE": PRINT : INPUT "(1-2):";QW$: IF  LEN (QW$) = 0 THEN
     5020
5030  IF  ASC (QW$) <  > 49 THEN  RETURN
5040  PRINT : INPUT "# OF SHAPES:";NS: IF NS < 1 OR NS > 23 THEN 5040
5050 LL = 256 * NS: POP : GOTO 309
62000  FOR QW = 1 TO 15:PL =  PEEK ( - 16336): NEXT : RETURN
63000  PRINT "                                                  (HIT ANY KEY TO CONT
     INUE):                "
63010 PK =  PEEK ( - 16384): IF PK > 127 THEN  POKE  - 16368,0: RETURN
63020  GOTO 63010
63990  PRINT  CHR$ (7): POKE 216,0
63991 PP =  PEEK (222): IF PP = 254 THEN  RESUME
63994  POKE  - 16303,0: POKE  - 16298,0
63995  PRINT "YOUR ERROR IS CODE #:"PP: GOSUB 63000: CALL 54915: GOTO 600
```

### Color Demonstrator

Listing 4 is a program that will give you an idea of your Apple's potential for great colors. Line 90 reads the byte value data necessary to create all the 4-byte configurations—that is the data from lines 81–82. Line 110 reads 140 combinations of the above configurations, consuming the remaining data. The rest of the program creates color rectangles of 140 different types, using various combinations of one 4-byte configuration above another 4-byte configuration.

Being in Basic, the program is slow, but the fill routines I use in all graphics packages are the fastest available. They're written in 6502 assembly and assembled into 6502 machine language via Lisa, and yes, the source codes are available.

There are two common ways to fill: on black screens with white line drawings and on white screens with black line drawings. I've done routines for both.

Adventure games rely on binary tables of scene data and machine language programs to read the data, draw the line drawings and fill the scene with color. Many adventure games on the market are boring because they spend too much time drawing scenes. My concept of a good adventure game is one in which the display techniques enhance, rather than limit, your enjoyment, so I've always concentrated on fill speed as priority number one when creating an algorithm.

### Drawing Hplot Shapes

Now let's go on to Hplot shape creation. It's not difficult to write a program that handles this, since we're merely drawing shapes composed of lines and saving numbers (counts) of coordinate sets and the coordinate sets themselves. Notice that the Hplot shape drawing algorithm Test O (Call2048) is loaded in early in the program in case you wish to retrieve and display any previously drawn shapes. Also, don't run this program unless ?PEEK(104) gets you 64. In other words, make sure the program that runs Hplot Shape Drawing does a POKE103,1: POKE104,64: POKE16384,0 before the running. This sets the start-of-program pointer to $4000, just above hi-res page 1. And leave HIMEM at default 38400.

Now refer to Listing 5 for my Hplot Shape Drawing program. To run it, hit return on your way into the program to clear the screen. Choose option 4 to draw an Hplot shape, and read the resulting instructions. After making sure the paddles or joystick are attached, choose shape number 1. The paddles are for cursor control, button number 0 for line draw, and button number 1 to quit. When a shape is finished and you want to save it, input its number as the Last Shape Drawn. If the last shape is over 256 bytes long, use option 1, Give Number of Shapes, when you get to the two options after file name inputting. You can draw a table of up to 23 shapes before quitting.

Next month we'll discuss block shapes, table look-up for speed, and simple page flipping. ■

# ZARDAX
## A Masterpiece Of Word Processing

**This little-known import from Down Under strikes gold in the U.S.A.**

**by Hartley G. Lesser**

Rising out of the mists, striking terror into the hearts of competition, spreading over the U.S.A. in ever-widening circles. . . it's Zardax. No Godzilla this. . . but a word processor, developed by Computer Solutions of Australia. It should make the Apple world take stock—and well it should. For there is much to Zardax that is impressive.

First, consider the packaging. Zardax arrives as though a shipment from Fort Knox. Copious and well-conceived wrappings protect and comfort the fragile contents—evidence of the manufacturer's regard for consumers.

Within resides a healthy-sized documentation manual, three 5¼-inch disks and shift-modification hardware. Zardax imposes the following system requirements: an Apple II Plus, 48K bytes of RAM, a language card or a 16K RAM card, one disk drive with 16-sector controller (3.3 DOS), a printer interface compatible with Apple Pascal; Apple II with Autostart and ROM Applesoft (or a language card).

The manual introduction is succinct. Only one paragraph boasts about the product; the others inform. Then those using Zardax for the first time are immediately referred to chapters 17 and 18 for hardware and software installation instructions, suggesting that those instructions were written as an afterthought. As most everyone will be starting Zardax from scratch, these directives might better appear after the introduction. Also, chapters 17 and 24—general information and guidelines for installation of the hardware and more specific and technical aspects—would be better as one.

Be that as it may, the information reveals support for a choice of shift modifications, one of which disables the game I/O socket for paddle operation and the other of which leaves it

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Future sale flyers will contain fabulous bargains, both old and new items.

So, to entice you to want to get on the mailing list, there are some super specials listed elsewhere in this page.

### SUPER-DUPER JOYSTICKS

Last month Barb ordered me a Wico joystick for evaluation without telling me first. When it came in I couldn't believe it. It is the most substantial joystick for the Atari I've ever seen. It's made by the same people who make the ones for the commercial arcade games. Made for the Atari, they will work with the Apple with an adaptor or the Joyport. There's also a fancier model with a chrome shaft and red ball on top. They also make a trackball controller that will blow your mind.

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They are two of the first games ever produced by a very famous software company. I bought the rights for them for $200 and decided to have some fun with them.

Made for the Apple, they come complete with a yellow documentation page, reminiscent of what you would find in your local supermarket. (After all, our shipping warehouse was at one time a supermarket.) Order #9008 for only **$9.99.**

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Our collection of Atari games continues to grow. My personal favorite now is Frogger. Until Jan. 30 you can have this $34.95 game for only **$19.94** when you purchase any other item. Please specify cassette or disk. The graphics and sound on this program are superb.

Airstrike by English Software is a new game that has been very popular overseas. It only takes 16K and comes in cassette and disk versions. If you're bored by ordinary arcade-type games, Airstrike will present an enormous challenge to you. List price is $39.95. Until Jan. 30 you can have it for **$29.94.**

### THANK YOU

Thank you to the many well-wishers on the birth of our son, Dale. He is very healthy and doing well. He's learning the computer business from the ground up. He's by Barb's desk every day. I'm sure many of you have heard him in the background when you call. You should see Barb trying to take an order over the telephone, punch numbers into the computer and nurse Dale, all at the same time.

One last item, we have a spiffy new lower case chip that's made for us locally. For a short time we are selling it for only **$15.00.** I wanted to call it the Buffalo Chip but I got out-voted. So, for $15.00 be sure to order the GGH lower case chip. (Can you guess what GGH stands for?)

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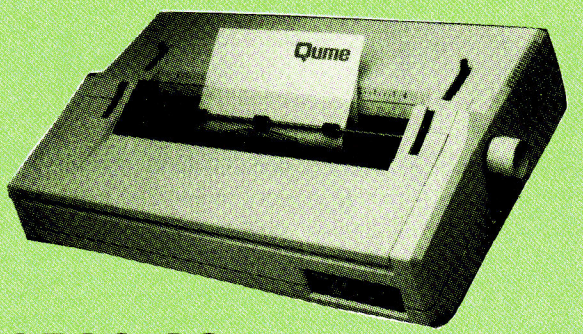


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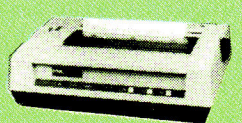

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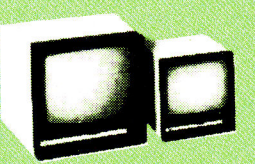

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operable. The manual also discusses shift modifications for other newer and older Apples, including those with serial numbers in the low thousands... the ol' classics. By reading chapters 17 and 24 even a novice should easily install the required shift modification. However, if you feel less than confident ask your dealer for assistance. Better safe than sorry.

The software resides on three disks: original and back-up program disks and the utility disk. With a two-drive system, Zardax goes in drive 1, the utility disk in drive 2. Zardax is booted from a program called SETUP.

Zardax can access the following 80-column boards: Vision-80, Doublevision, Smarterm, Videx Videoterm, Sup 'R' Terminal, Digicard, ESP 8024 and Vantec-80—rather complete support for the most popular boards on the market.

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The list of printers supported by Zardax through specific parameter files includes numerous NEC and MX-80 machines, representatives from Qume, C.Itoh, Tandy, Epson, Centronics, NDK, Olivetti, Xymec, IDS, Anderson-Jacobsen, Diablo and any machine using Diablo compatible escape codes. It's an impressive array; and there are even more printers that could be used, depending on your competence in writing different parameter files. You must also designate the appropriate parameter file to be loaded from the utility disk to the master, do the transfer, then input the type of printer interface you have. Now you're ready to Zardax yourself into a state of total enjoyment.

Section II, chapter 2 of the manual, "Introducing the Computer," is written for the novice. The chapter would be especially helpful to one who has just purchased an Apple and Zardax together and wants to delve right into word processing. A general definition


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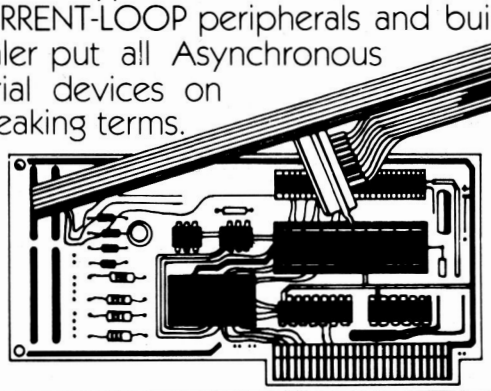

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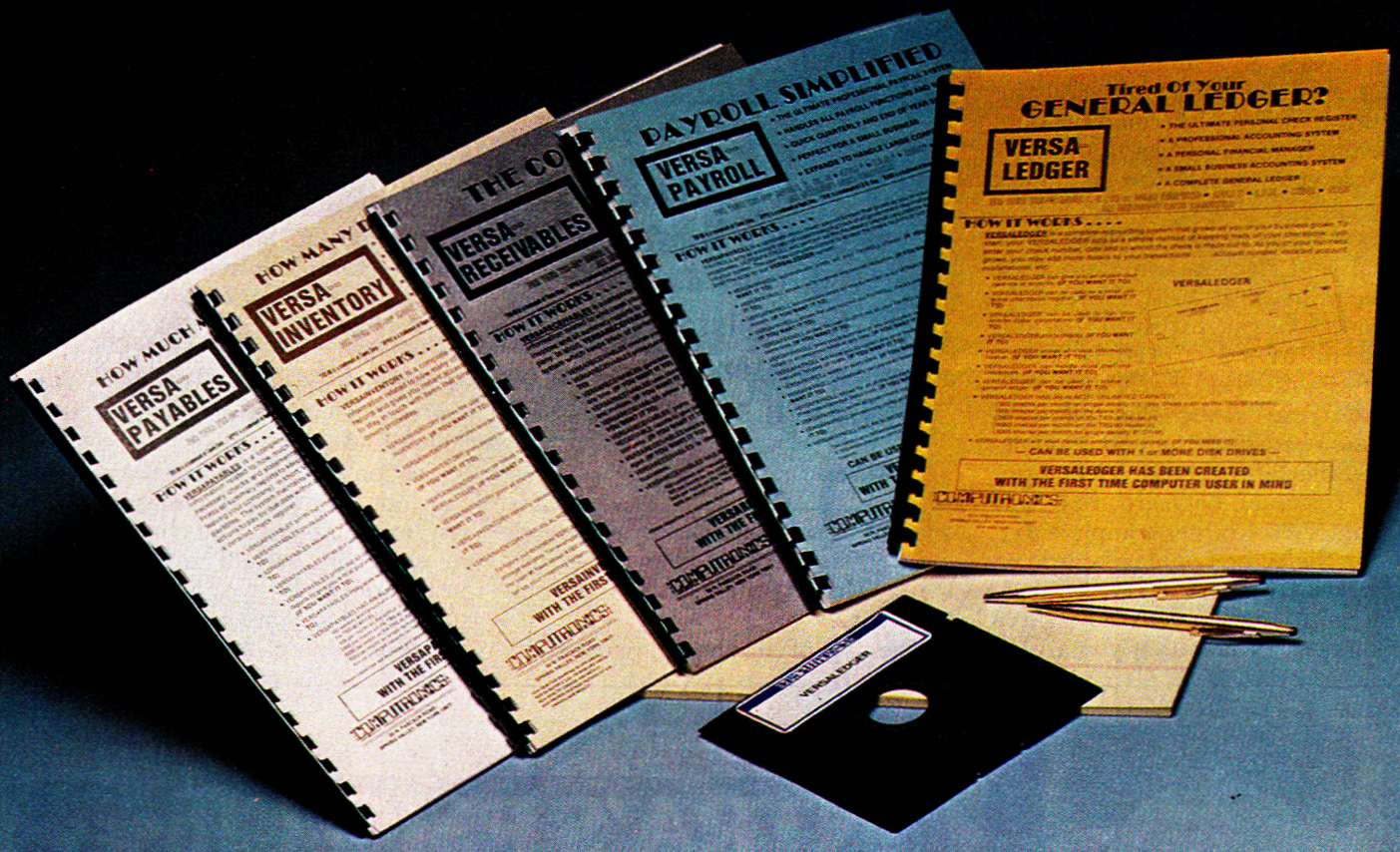


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**"To save your Great American Novel press Escape and, lo and behold, the Inner Menu returns."**

of a computer comes first, followed by explanations of the elements of a computer program, what the Apple keyboard is and some of the special keys used by Zardax. Information and helpful hints regarding the monitor, files and documents, printers, buffers and the handling and care of disks and disk drives round out the chapter.

After the setup a Control-Reset reboots the system. Within 30 seconds the Main Menu appears on your screen, complete with a catalog of the documents currently on your master disk. The Main Menu offers the following command options: Create, Print, Multipr, Vidmulti, Retrieve, Transfer, Delete, Look, Unlook, Glossary, Newdisk, Index, Exit and Which?

Press the escape key from the Main Menu and a secondary, or Inner, Menu is revealed. It offers Change, Draft, Main Menu, Print, Rename, Save, Videoprint and, once again, Which? The power of Zardax lies with its simplicity.

From the Inner Menu, M regains the Main Menu to initialize/format disks to be used with Zardax. Here I ran into the first of only two problems with this product. No consideration is given a two drive operation. If you have two drives you might assume that since the utility disk was accessed in drive 2 during setup, you should leave it there for initializing. What a disastrous assumption to make, for if you do, forget that disk ever existed. It isn't explained—until Section III, Chapter 8—that a Transfer command via the Main Menu is necessary. Once this has been accomplished, everything is handy-dandy. For those with a single disk drive there is really no problem. The removal of the master disk is automatic. . . you can't readily stuff two disks into the same drive and expect results.

To create a document press C from the Main Menu and Zardax asks you to name your about-to-be-created masterpiece, then the screen clears leaving your document name at the lower margin. The number 1 informs you of the current character position of the flashing cursor. Want all caps? Press Escape once. Lowercase only? Press Shift once. Combination of both? Your keyboard operates just like a typewriter—just shift for capital letters.

Zardax doesn't word-wrap for you. Don't be concerned when, as you're joyfully typing away, the word "helpless" disappears off the end at the right margin. The rest will appear at the beginning of the next line. Formatting is done automatically when your document is printed in either draft or final form.

To save your Great American Novel press Escape and, lo and behold, the Inner Menu returns. Press S and your text is saved to disk, garnered by the name you chose.

Got typos that need fixing? C for

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Change sends you into the edit mode.

Control keys move the cursor to areas that need reworking. Control-R moves it right, Control-U sends it up. Guess what Control-D and Control-L accomplish! Control-F asks you to name the word or symbol you want to replace and then the replacement. Type it in. When the unwanted material is located you can specify to change it, not to change it, or to change all such wayward characters.

Videoprint is a handy feature that allows you to view your formatted text on the screen before printing. Should you find typos, or less-than-perfect positioning of text, you still have time to go back and change the errors. Draft prints the document, but only one copy. Labels will be printed as such. A label is a field of information to be taken from another source, such as the keyboard or a disk text file, and input into your text during printing. This fantastic tool enables form letters to reek with the writer's personality. More on this later.

Print is the choice when more than one copy of a letter is needed. Document printing can be initiated from either the Main or the Inner Menu.

With most word processors, document formatting is particularly frustrating. Zardax has done its best to eliminate some of these concerns.

It utilizes two general types of formatting commands, those that format the printed page itself, and those that format text within the page. All Zardax formatting commands consist of at least three characters.

You can set up paper guidelines with choices of continuous or cut forms, form and page length, left and right margins and page numbering.

Margins, indentation, right justification, double or single spacing and pitch (for letter quality printers) are all simple to use.

Several advanced features are available, including find and replace, tabbing and moving the cursor up or down ten lines. Special characters that don't appear on your keyboard are available. You make them by dual-pressing control and another key. There's a sophisticated Cut and Paste, and you can insert other documents from your disk into the current work with a Control-I.

Paragraph movement is child's play. Position the cursor anywhere in a paragraph, press Control-M and Zardax asks if you want the paragraph moved up or down. Type U or D until the paragraph arrives at the desired location. The text doesn't disappear into some mysterious buffer off-screen. You can always tell where your paragraph is. A quick tap of the spacebar and it's a permanent change.

Control-X, which marks areas in your text, is used with Control-P for moving sections of text around in your document. Characters are deleted

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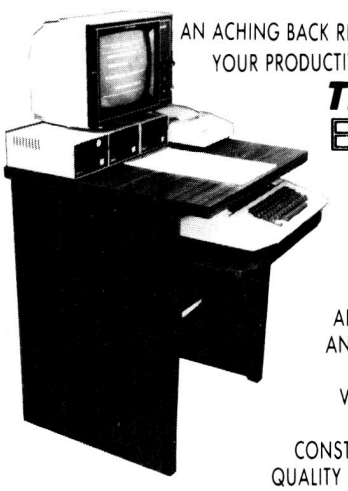

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**"Talk about easy. . . and the letters have that personal touch money can't buy."**

with the left and right arrow keys, or Control-W, which asks if the offending material is above or below the present paragraph and if the Control-X has marked an area for obliteration. Zardax also supports underlining.

One of the most fascinating and useful features of Zardax is the Glossary for repeated phrases. For example, an administrative assistant must get awfully tired of continually typing in

Sincerely yours,
Adwart McSkinflindt
Vice-President, Know-It-All
Division

rtphnk/AM

It's simple to remedy. Merely create a glossary with the above closing as item A. After the glossary has been saved, when it's time to enter the greeting, all that's needed is to type Control-G and enter A.

Personalizing letters is rather simple with the "curly-brackets" produced by Control-8 and Control-9. Save the document under an original name, such as Form Letter1. Then produce a second document containing the names of the people to whom you wish to personalize the letter, and save it as, perhaps, Name File1. Form Letter1 would then be retrieved from the disk and printed, with Zardax asking if the information within the curly brackets will come from disk or the keyboard. If the former, a Catalog will display the contents of the disk for your selection. Everything is automatic from that point on. Talk about easy. . . and the letters have that personal touch money can't buy. Mailing labels are just as simple.

The remainder of the Zardax documentation delves into all of the commands available, special key use (Zardax can print almost all of the ASCII character set, including the control codes such as Escape), changing the character set used by Zardax, and it lists some of the procedural programs accessed by Zardax—the latter for experienced programmers only.

But, didn't I say something about two problems? The second problem was with my Grappler printer interface for my Epson MX-80 with Graftrax. During setup, Zardax stated that the interface appeared to be #3, a firmware card. I entered this selection, and nothing occurred. I could format text, save text, and even videoprint the material, but print it out? No way. I experimented for a while, re-entered Setup, changed the parameter to parallel card, and it worked.

I highly recommend Zardax, for its functionality, its flexibility, and its ease of use. If word processing is an art, then this product is a Rembrandt.

Zardax is manufactured in Queensland, Australia, by Computer Solutions Ltd. U.S. distributor is Action-Research Northwest, 11442 Marine View Drive SW, Seattle, WA 98146. ■


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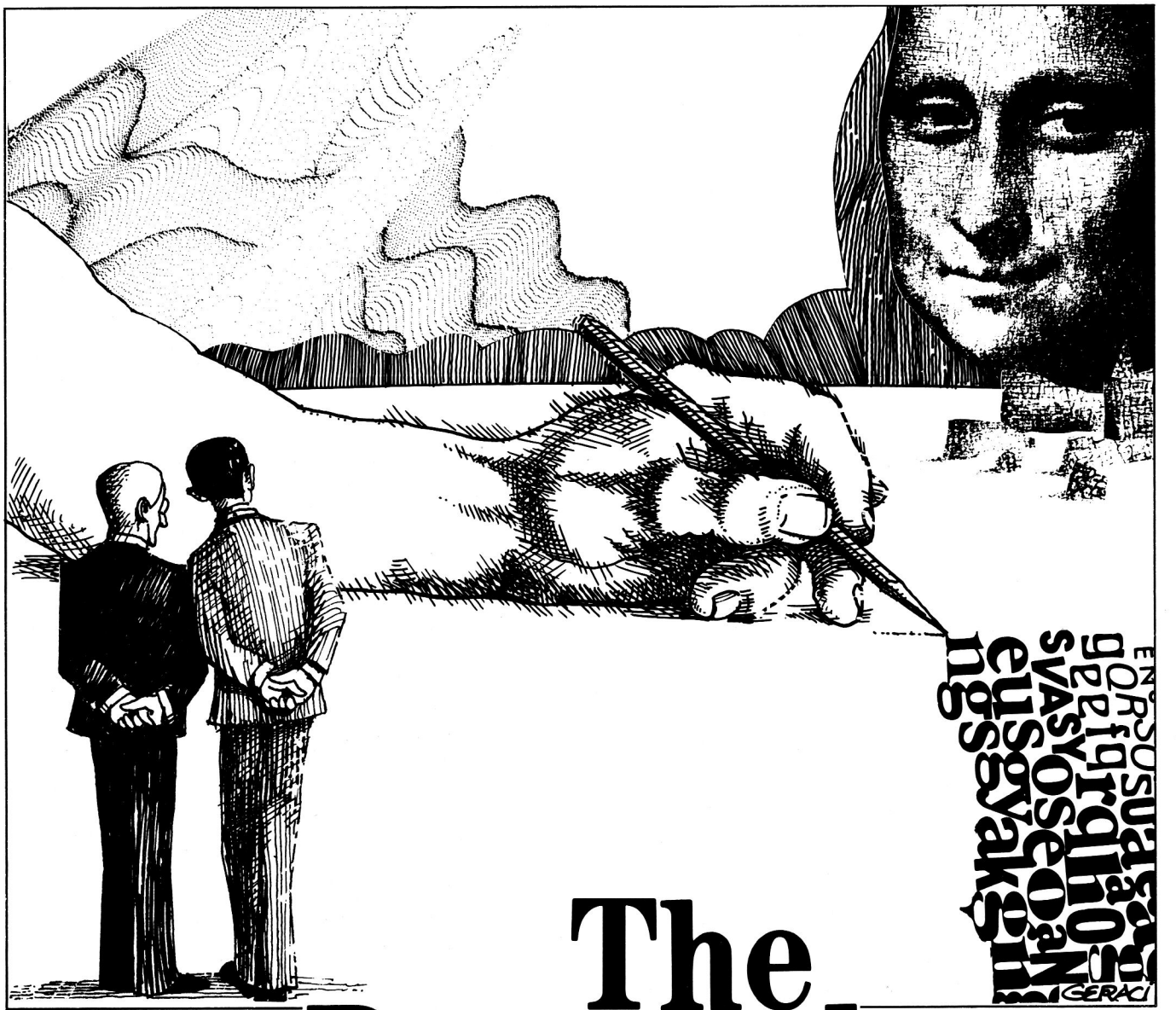



# The Personal Secretary

**by G. R. Brieger**

The Personal Secretary is an excellent word processor for the computerist on a budget. For $100, you get one program disk and a rather thin user's manual; lowercase adapter and a shift key wire are included for installation in your Apple, to give it typewriter-like operation. You can use TPS with one disk drive, but dual drives are convenient.

A lowercase adapter is essential if you want to use the Apple for word processing. The shift key modification is very useful, especially if you touch-type. The shift key wire can be attached semi-permanently, to avoid problems with the Apple's warranty.

In short, here is a real bargain. The *Personal* Secretary is the little brother of SOF/System's *Executive* Secretary. You can upgrade to the larger program

*Address correspondence to G. R. Brieger, 2716-174th Ave. NE, Redmond, WA 98052.*

at any time, and have $50 of your initial investment credited. Files from The Personal Secretary are compatible with the senior system.

In fact, the difference between the two programs may not matter to most users. The junior program lacks telephone or electronic mail handshaking, alphabetical indexing, a serious user's manual, support for 80-column boards and an additional cost of $150. The thing you'll probably miss is a good manual. More on that shortly.

TPS is easy to learn, if you can get enough out of the brief documentation, and are willing to overlook several mistakes. I assume that the manual is a digest from the Executive's package. Occasionally, you will find a reference to menus which vary from what is printed in the manual, and reference to slightly different commands. Don't let that discourage you—The Personal Secretary is a *friendly* program.

The whole manual is written in the style of a tutorial—easy to read, and consisting of 16 lessons. A table of contents, a two-page appendix and an alphabetic index are included. What's missing is a summary of commands, but the nice thing about TPS is that it has only those commands you'll really require.

You can compose and edit easily: insertions, deletions, corrections and formatting are accomplished quickly. Text centering is done with embedded format commands. Type *>cn* and centering is turned on. Type *>co* and it's turned off. (By the way, if you look in the index for "centering," it's described on page 28, not 38 as the index would tell you!)

You can justify text or have a ragged right edge. Tabs can be set up anywhere and may be left or right justified. Right-justified tabs are useful if you are typing something like a price list. Dollars and cents will automatically line up. Scrolling through the text and moving the cursor (called marker in the manual) while in edit mode is easy and quick. Cursor movement is exceptionally versatile.

You can embed special printer instructions in the text for virtually any printer. If you have the right kind of printer you can get boldface, shadow printing, red and black ribbon changes, subscript and superscript, etc. If you have a dot matrix printer the software can access all available fonts, and most can be intermixed in one line. The manual makes a few suggestions here, but does not give any details.

| | | | | |
|---|---|---|---|---|
| ESC | P | = | >.co | #27,80 Turns On compressed mode |
| | Q | = | >.cf | #27,81 Turns Off compressed mode |
| | 4 | = | >.io | #27,52 Turns On Italics |
| | 5 | = | >.if | #27,53 Turns Off Italics |
| | E | = | >.eo | #27,69 Turns On Emphasized mode |
| | F | = | >.ef | #27,70 Turns Off Emphasized mode |
| | G | = | >.bo | #27,71 Turns On Bold mode |
| | H | = | >.bf | #27,72 Turns Off Bold mode |
| | S | = | >.xo | #27,83 Turns On Expanded mode |
| | T | = | >.xf | #27,84 Turns Off Expanded mode |

*Table 1. Epson MX-80 printer commands.*

Since the Epson MX-80 printer is one of the more popular ones—I use it—I have constructed Table 1 to show you how to set up TPS to access its fonts. Similar tables can, of course, be constructed for other printers, provided you know the escape codes.

I made the commands as mnemonic as possible (e.g., *c* for Compressed, *o* for On, *f* for Off). You can use any combination of two letters. Most of the commands can be combined, to give you additional fonts like ***bold italics***, **bold emphasized**, etc. Save the table as a separate file—Epson Fonts, perhaps—and it will be available any time without having to be retyped.

One advantage of the thin manual is that the new purchaser might read it through. The best advice I can give, for learning to fully use TPS quickly, is to turn on your monitor, insert the TPS program disk in your drive and start the tutorial process on page 6.

When you get to the end of lesson 3, you will encounter a confusing error. There are many good menus in this program, and you have just encountered one more. You are advised by the manual to pick C, but the menu gives three choices labelled 1, 2 and 3. You have the right menu—just pick selection 3.

Going right along with the tutorial, you will soon learn how to move, copy and delete blocks of text. A block of text can be as long as you like, provided you do not exceed space in memory when copying.

Next you encounter the feature that lets you search for, or search for and replace, a word or string of words. In this manner you can quickly find a specific place in a long document. If you find a word you have consistently misspelled, you can replace each occurrence with the correct spelling, using the search/replace function.

Unformatted text can be printed directly from editor mode. If you want to print the formatted document, it must first be saved. Printout is somewhat slower than what I'm used to, especially if the program encounters a format change.

The program contains a mail merge utility linked to another powerful feature of TPS, an electronic card file. The card file is accessed from yet another of the numerous menus, and is configured as an address file. You can have 300 addresses on one disk, or rename the electronic card to keep an inventory of your record or book collection, etc. The files can be sorted alphabetically and searched by fields.

You can incorporate VisiCalc print files in the word processor. This feature works well, but it is poorly described on pages 30 and 31 of the manual. For instance, the VisiCalc command for printing to disk is */PF*; you are not asked for slot # or D unless you have one of the old 13-sector versions.

To obtain a backup disk, send in the warranty card and $7.50. You should have one, since accidents can and will happen to the floppy disk medium. SOF/SYS will not support this program by phone.

The Personal Secretary costs $99.95, from SOF/SYS Inc., 4306 Upton Ave. S., Minneapolis, MN 55410. ■

# Apple IIe . . .

## Worth the Wait?

**Our technical editor reviews the new Apple IIe and explains why this machine is more than user friendly.**

**by Hartley G. Lesser**

The cover is off! The IIe, officially announced at Apple's Annual Meeting, could well be the key to Apple Computer's continued success. And for those of you who want to know my opinion before reading any further, the IIe is a fine product, far easier to use than its predecessor. But if you're already familiar with the Apple II+, you'll have to get used to a few changes.

Apple's newly found consumer awareness is based upon economics. The novice computer user is responsible for an increasingly large percentage of the market, and each month that percentage increases. What need does the novice have of an unfriendly machine?

The IIe presents a timely change in Apple's marketing techniques: Apple's much-improved documentation and advertising copy describe the IIe as "user-friendly," and so it is, though the IIe is capable of more than friendliness—it could become a true friend. Of the two models, International and Domestic, I've chosen to focus on the IIe aimed at the North American market.

You'll recognize the Domestic model by its white keyboard characters. The International model has black characters. The outward appearance of both plays upon the instant recognition of the old Apple II. The case, save for slight color and logo differences, still looks like an Apple II, except for one outstanding difference —the keyboard.

*Consumer reaction to both Domestic and International models should be swift in coming.*

### The Keyboard

Comprising 63 keys, the full-sized keyboard enhances the computer's overall appearance. The keys access the full ASCII character set, consisting of 96 printable characters (26 lowercase, 26 uppercase, 10 numerals, 34 special characters and 32 control characters). See Tables 1 and 2. The *control* key, pressed in combination with a character key, forms a control character. An example of a control character is *control-C*, which many programs recognize as a cancel command. Seven of the control characters are single-stroke keys, six being cursor movement keys.

A *caps lock* key is located in the lower-left portion of the keyboard. This lets you use the keyboard functions much as you would the old Apple II's.

A *single quote* key (lower-left side) produces a left single-quote character;

| Group | Characters Available | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ |
| Special* | | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | – | . | / | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| Uppercase | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ |
| Lowercase | ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r | s | t | u | v | w | x | y | z | | | | |

*The first "character" for Special is a space.

*Table 1. The Apple IIe keyboard characters.*

depressing the *shift* key in conjunction with this key produces an alternate character, the tilde (~). You'll find the more widely used *single quote* and *double quote* keys on the right side of the keyboard—no more stabbing at shift-2 for those quotation marks. Shift-2 now gives you an @.

If you want to strike that damnable *reset* key on the IIe, you're going to have to go out of your way to do it. For those who owned the earlier Apples, where but a breath on the reset key caused major destruction, this is quite a change. No more chance of ruining your life's work by barely missing *return* and sliding into reset. Even if you stretch that little finger to its maximum, the reset key, now safely isolated in the upper-right corner, is hard to touch. A combination keypress of both control and reset is required for program annihilation.

And don't go searching for a control key the size of a character key. You won't find that on the IIe keyboard. Control is the same size and shape as the return key on the Apple II, and is located on the left side of the keyboard, directly above the shift and below the *tab* key.

Apple has finally built in lowercase capability. About time! Consumers have been patient with Apple, and it's pay-off time. No need to purchase a lowercase chip, or a shift-modification device, to give your computer that much-needed ability. Either of the two shift keys will do the trick.

Resting your right thumb on the *space bar* is out. Every key has an auto-repeat feature—if the key is held down for more than a second, the character (or space) automatically repeats. This convenient feature takes time to get used to.

On the lower-right side of the keyboard are arrows pointing left, right, down and up. Could these be cursor movement keys? Indeed they are. Defining I, J, K or M for cursor control is no longer necessary.

Tab (above the control key, remember?) also moves the cursor; normal tabbing is set at about eight characters, though many programs allow you to set your own tab stops. These functions only work, however, if the program you're running recognizes their presence.

In the area where the *reset* key used to squat, there is now a large *delete* key.

*Open-apple* and *closed-apple* keys, found on either side of the space bar, are special-purpose keys. The open-apple key bears an outline of the Apple logo, while the solid-apple logo is filled. They are keyboard representatives of the paddle #0 and paddle #1 buttons, thus allowing your IIe to emulate a pair of hand controllers. But that's not all.

The two "apples" have other special functions. By pressing open-apple and control-reset you can restart the system when all power is on. Solid-apple and control-reset initiates the built-in self-test for the IIe. This test verifies that all internal circuits are functioning properly. For about 20 seconds patterns move about the monitor screen, indicating that the tests are being conducted. If the circuitry checks out, the message "KERNEL OK" is displayed on the screen.

Another change is the *esc* (escape) key, now in the upper-left corner of the keyboard. This key tells the computer to begin an escape sequence.

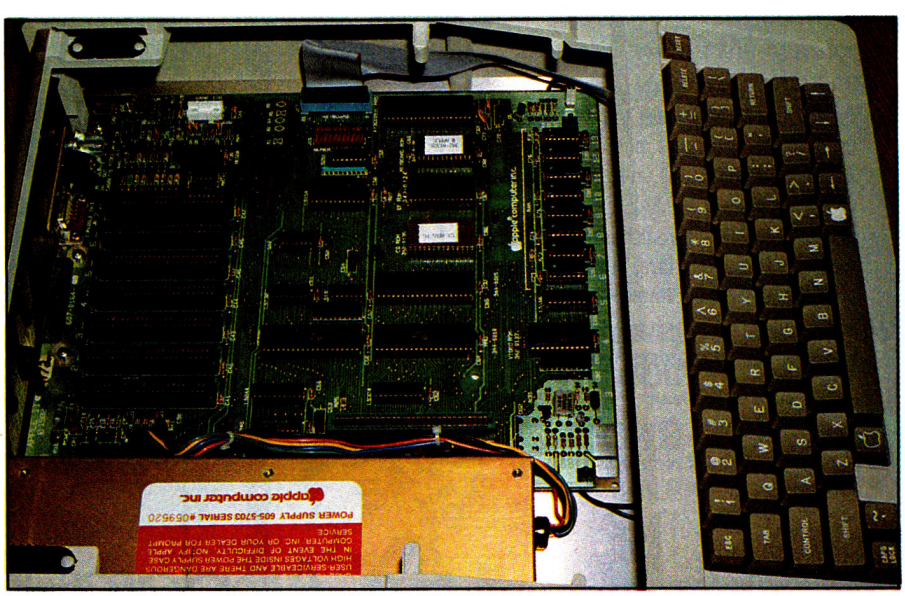
Typing on the new computer may take you a little while to get used to, as many symbols are in new positions. I found that after about a day's practice, I could maneuver about the IIe's keyboard with little difficulty and hardly any loss of speed.

Another nice feature is that all control characters work with both lower- and uppercase keystrokes. I highly rec-

| Character | Name |
|---|---|
| a–z | lowercase alphabet |
| [ | opening square bracket |
| \ | reverse slant—backslash |
| ` | opening single quote |
| \| | vertical line |
| } | closing brace |
| ~ | tilde |
| DEL | delete—rubout |
| ___ | underline |

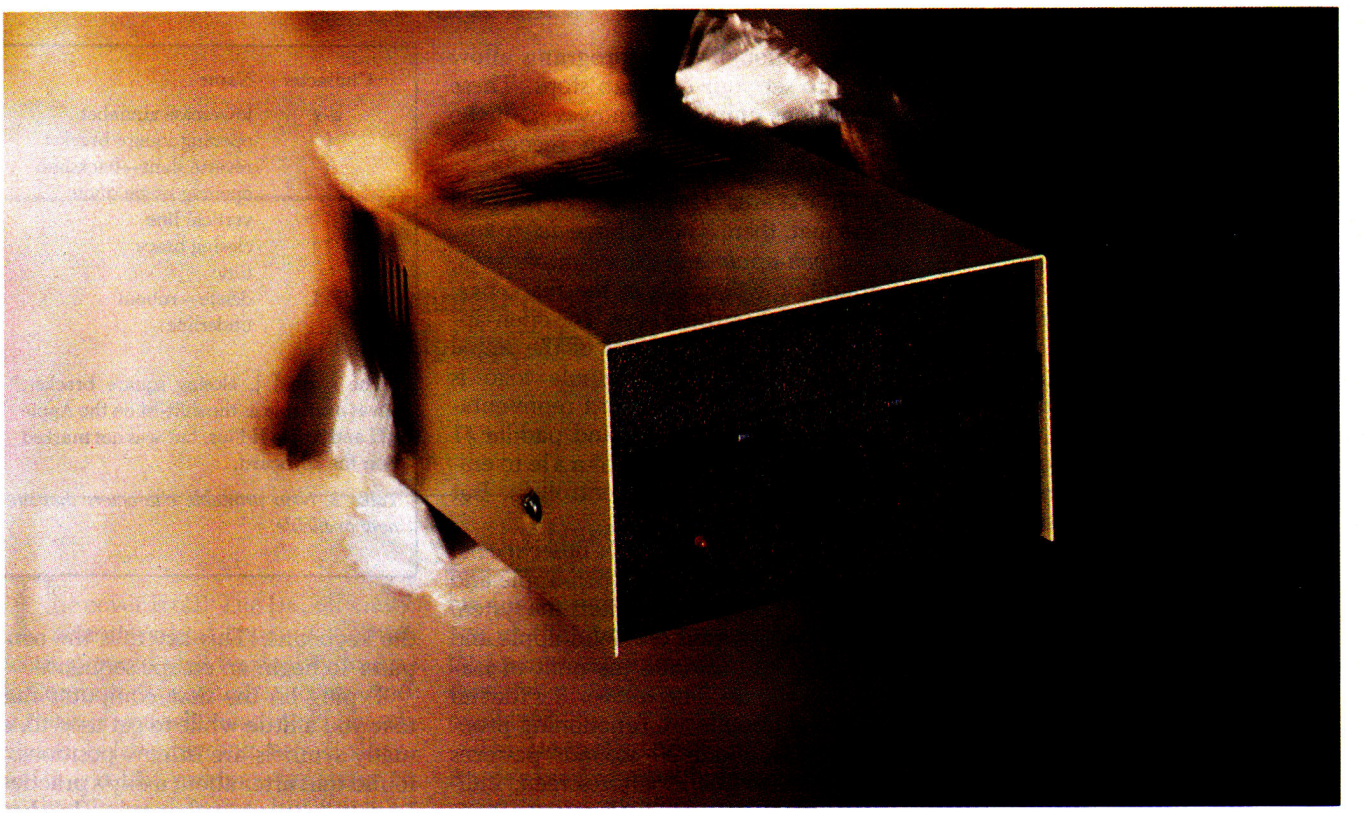
The symbol ], closing square bracket, was available as the shift-M on the Apple II and Apple II Plus, but was not marked on the keyboard.

*Table 2. New printable characters that are now available.*



*The Domestic model, open for inspection.*

# $299.



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| Characters | IIe Primary (no 80) | IIe Alternate (yes 80) | IIe with Applesoft |
|---|---|---|---|
| Normal uppercase/special | Y | Y | Y |
| Inverse uppercase/special | Y | Y | Y |
| Flashing uppercase/special | Y | N | Y |
| Normal lowercase | Y | Y | Y |
| Inverse lowercase | N | Y | N |
| Flashing lowercase | N | N | N |

**Legend:**

Y = yes
N = not available, or displays incorrectly
yes 80 = 80-column card both installed and active, or alternate character set selected by programmer
no 80 = 80-column card either not installed or not active, or primary character set selected by programmer

*Table 3.*
*Special commands are available in certain modes.*

ommend keeping your IIe in *caps lock* mode when using programs running under DOS or in Basic, since these systems won't recognize some of the new characters. Basic recognizes lowercase letters only if they're between quotation marks.

The IIe's keyboard feels more comfortable, and seems smoother in operation than my Apple II's. Due to the new design, the video display is much improved as well. To highlight, the IIe has the following improvements for its users:

- Apple II and II Plus character set, with lowercase
- An alternate character set, with its own upper/lowercase
- Alternate character set has normal and inverse fonts
- Additional display functions available from both programs or keyboard
- New software switches that control the video display (programs can write and read them)
- 80-column text display.

The alternate character set capability is a fantastic feature for the International IIe. This lets you program in *any available language!* On the International machine, the native language characters appear in black boldface in the center of each key, with the English-language equivalent on top. On Domestic models, the roles and letter colors are reversed. The alternate character set is normally only selected when there is an Apple IIe 80-column card (yes, folks, that's right—Apple *has* its own board now) installed and active.

French and German character sets are ready for immediate release, and Apple is looking at 15 different character sets for system inclusion. What a boon this is for computerists in the international community, who have had to learn English before they could program their Apples!

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**"Where the Apple II had 110 integrated circuits (ICs), the IIe has only 31! And the motherboard no longer disappears under the keyboard..."**

sures the IIe of surpassing FCC regulations regarding interference, and also reduces internal noise. The Apple II notches have been replaced by 12 rectangular openings.

Disk drives, which require 19-pin connectors, are inserted through openings 1 through 4. As many as six disk drives can be used with the IIe. Peripheral devices requiring 25-pin D-type connectors find entry through openings 5, 8, 11 and 12. Those devices needing 9-pin connectors are fitted through openings 6, 7, 9 and 10; these openings can also be used for 5-pin DIN-type connectors. Granted, a new computer user probably isn't going to remember which opening is for which device, so Apple has included a miniature diagram on the back panel. It depicts the type of device attachable to each of the four built-in connectors.

Looking at the back of the IIe, you'll see the power on/off switch in the same location as on the Apple II. On the left, the video-out, cassette-out and cassette-in ports, and an additional 9-pin connector for hand controllers, are located next to one another. The latter accommodates newer paddles and joysticks, so you won't have to reach inside and plug hand controllers into the game I/O connector. Many a bent pin and ruined controller testify to the hazard of performing this task on the old Apple II. However, 16-pin hand controllers may still be plugged into the interior game I/O port, if needed.

### Under the Hood

It's time to scrutinize the IIe's internal workings. Differences between Domestic and International models are minimal, and I'll continue to focus on the homestyle version. We'll be making our inspection by placing the keyboard in front of us.

What a change you'll see inside! Where the Apple II had 110 integrated circuits (ICs), the IIe has only 31! And the motherboard no longer disappears under the keyboard, thus making servicing easier. No more fidgeting under the keyboard pins trying to do this, that or the other thing. There'll be no need to remove the case, as everything is within easy reach once the cover has been removed. This will save you labor time and servicing costs.

What strikes you at first as being strange? Could it be the slot arrangement? Note there is a slot directly to the right of the power unit, fully three-quarters forward on the motherboard. This is the auxiliary slot, in which your 60-pin 80-column video card or other special card can be inserted.

Seven 50-pin slots are arranged toward the rear of the computer, in familiar territory. They are numbered 1 to 7. But where is slot #0? Anyone with a language or RAM card in their Apple II knows full well slot #0 used to exist. Well, slot 0 isn't needed any longer. Built into the IIe is 64K bytes of RAM.


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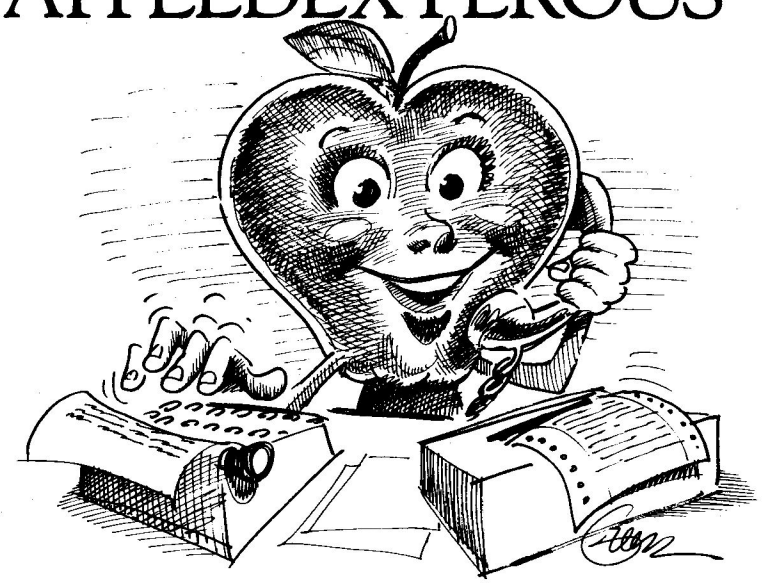

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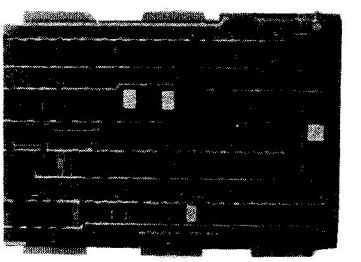

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| | Inactive Mode | Active-80 Mode | Active-40 Mode |
|---|---|---|---|
| Inverse | white screen<br>black characters<br>no lowercase | all characters available in normal and inverse | |
| Home | clears to black screen, white characters | clears to black screen, white characters | clears to black screen, white characters |
| Inverse Home | clears to white screen, black characters | clears to white screen, black characters | clears to white screen, black characters |
| Flash | cursor and prompt blink<br>no lowercase | Flash is not available | Flash is not available |

*Table 4.*
*Some commands are affected by selected display modes.*

This also includes the functional equivalent of the language card, which was available at additional cost on the old Apple II. The 6502B processor, the same chip that did the "thinking" for the Apple II, can be found directly in front of slot #3.

If you'll look into the upper-left corner of the motherboard (the green board underneath all of the chips), you'll see a small red light. This is an LED that tells you if the power to the computer is on. If lit, peripheral devices shouldn't be connected or disconnected. Should you forget to look at the recessed power-on switch on the keyboard before working on your IIe, this LED will remind you of its power status.

Further right is the rf modulator connector, needed if a TV is going to be hooked up. This modulator converts the video output signal to one that the TV can decipher and display. The large white connector below the rf connector is the 16-pin hand controller connector. This connector's design prevents you from incorrectly plugging in the peripheral.

The cassette I/O ports, as well as the video port, are plainly marked. I question the need for the cassette ports, as most cassettes require Integer Basic. Perhaps some consumers still have Integer programs on cassette, and need these ports to load and run their programs. Apple's concern for what must be a small minority of users is interesting.

Directly forward of the white game I/O connector is the blue keyboard connector, with a cable inserted into same. No more fussing about under the keyboard to unplug it for servicing. The connection is handy, and lets you plug in any compatible keyboard. The keyboard ROM is found one row down and one position to the left.

Toward the front of the IIe you'll note a white logo and the Apple name. A heavy white line partially encompasses the eight chips that constitute the 64K bytes of RAM. In addition, there are 16K bytes of firmware in ROM. (Firmware programs are factory installed in ROM, and cannot be changed.)

The video ROM chip can be seen two positions to the left of the 64K dynamics at the start of row 4. Besides the resident video and monitor programs, additional firmware includes the 80-column display-handling routines, a set of computer self-tests and a new full-reset. This reset, which should prove to be a power-switch saver, is invoked by the open-apple and control-reset keys.

Here are some other nice-to-know facts: The IIe's power consumption has been halved. The speaker is mounted flat over an acoustical vent in the base of the computer case, and provides far better sound. (You'll locate the speaker in the left front area of the computer case.) The IIe has been operated successfully in temperatures as low as 0 degrees Celsius, and as high as 90 degrees Celsius without ill-effects. (I wonder how the operator fared in that 194°F room.)

## Display Details

Apple manufactures two 80-column cards for the IIe; either will fit into the auxiliary slot. Why two? Basically, because some consumers will want the standard 80-column card with 1K RAM (to handle the 80-column text display), while others will prefer the 80-column card with 64K RAM. This latter card doesn't mean you'll have a

| Enter This | Observe This |
|---|---|
| Escape-@ | Screen is cleared. Cursor is sent to Home position |
| Escape-E | Text is deleted from the cursor to the end of the line |
| Escape-F | Text is deleted from the cursor to the end of the screen |
| Escape-I or i<br>Escape-up arrow<br>Escape-D or d | Escape mode turned on, cursor moved up |
| Escape-J or j<br>Escape-left arrow<br>Escape-B or b | Escape mode turned on, cursor moved to the left |
| Escape-K or k<br>Escape-right arrow<br>Escape-A or a | Escape mode turned on, cursor moved to the right |
| Escape-M or m<br>Escape-down arrow<br>Escape-C or c | Escape mode turned on, cursor moved down |
| Escape-R | Turns on Uppercase-restrict mode |
| Escape-T | Turns off Uppercase-restrict mode |
| Escape-4 | Active-80 mode switched to Active-40<br>Screen cleared, cursor to Home position |
| Escape-8 | Active-40 mode switched to Active-80<br>Screen cleared, cursor to Home position |
| Escape-Control-Q | Computer back into Inactive mode. Should have a checkerboard cursor |

The uppercase-restrict mode has a very useful application when writing Basic programs that need lowercase letters within print statements. After entering Escape-R, lowercase letters will appear within double quotation marks, and everything outside the double quote marks will appear as uppercase letters.

*Table 5. Escape features truly worthwhile.*

**"The card has three modes: Inactive, Active-80 and Active-40, all accessible through soft switches."**

128K computer, however—this is bank-switchable memory. Let's look first at the simpler version.

The 80-column card consists of a printed circuit containing five ICs that work with the ROM firmware to display 80 columns of text. For Pascal and CP/M users, nothing could be simpler to engage. Simply boot your Pascal start-up disk; or, for CP/M, make certain you have your Z-8, Z-Card or Softcard installed correctly and boot your CP/M operating system disk. There's your 80-column text displayed on the screen.

The card has three modes: Inactive, Active-80 and Active-40, all accessible through soft switches. Simply booting the Pascal start-up disk engages the Active-80 mode. However, if you just boot up your DOS disk, you'll be in the Inactive (normal 40-column) mode. You would want to keep the 40-column mode if you were running software that used a 40-column display exclusively. Active-40 mode maintains Active-80, but puts a 40-character display on the screen.

Remember the command PR#3 that you used on your Apple II? It works equally well here on the IIe. After booting DOS, simply enter PR#3 and you're in Active-80 mode.

Something new to look for is the changing appearance of the cursor, which helps identify what mode you're in. The cursor definitions are:

Checkerboard
80-column card either not installed, or Inactive

Inverse plus sign
Escape mode while in Active-80 or Active-40 modes

Inverse cursor
Using Inverse and Home commands in Basic

To change your mode is relatively simple. For example, if you're using Basic or DOS in the Active-80 mode, and you want to go into the Inactive mode, just press and release the escape key. You now have an inverse plus sign as your cursor. This escape mode clue has been issued by IIe. When this cursor sign is present, you can move your cursor all over the screen without affecting what you've typed there.

To deactivate the 80-column display, press escape and the number 4. The cursor becomes a white square, and you're in Active-40 mode, but all of the special functions of the Active-80 mode are still available to you.

Commands such as Inverse, Normal, Flash and Home work differently, depending on which mode you're in. See Table 4 for specifics. Tabbing, again depending upon your mode, simply requires a little thought.

While in Active-80 or Active-40 mode, special escape features, as shown in Table 5, are worth the cost of this board. If you're in Active-40 or Active-80 mode and are writing either Pascal or Basic programs, some control features are accessible. The results of


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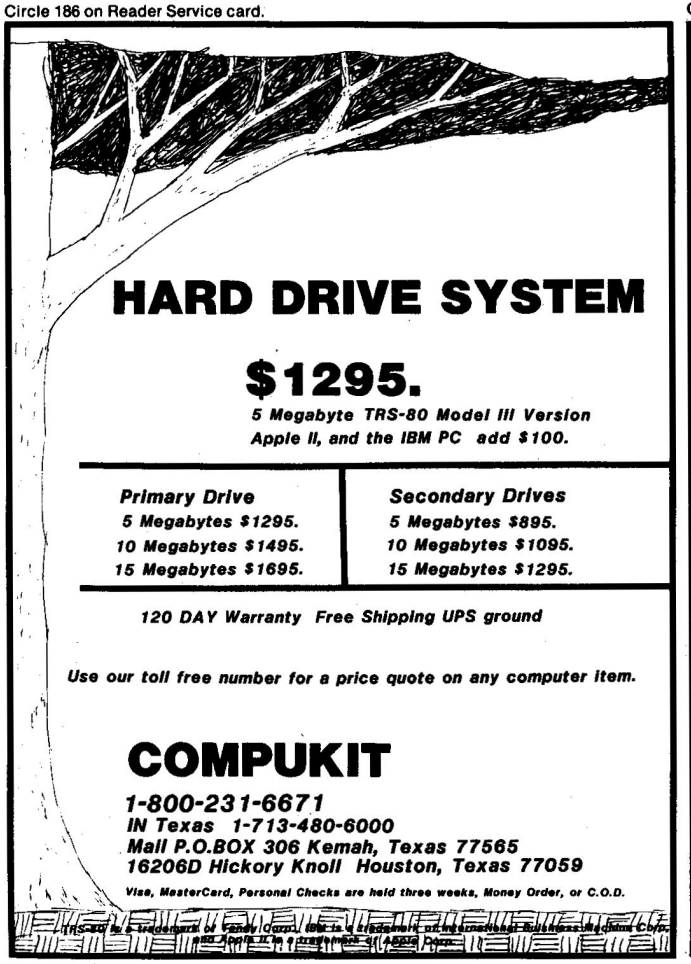


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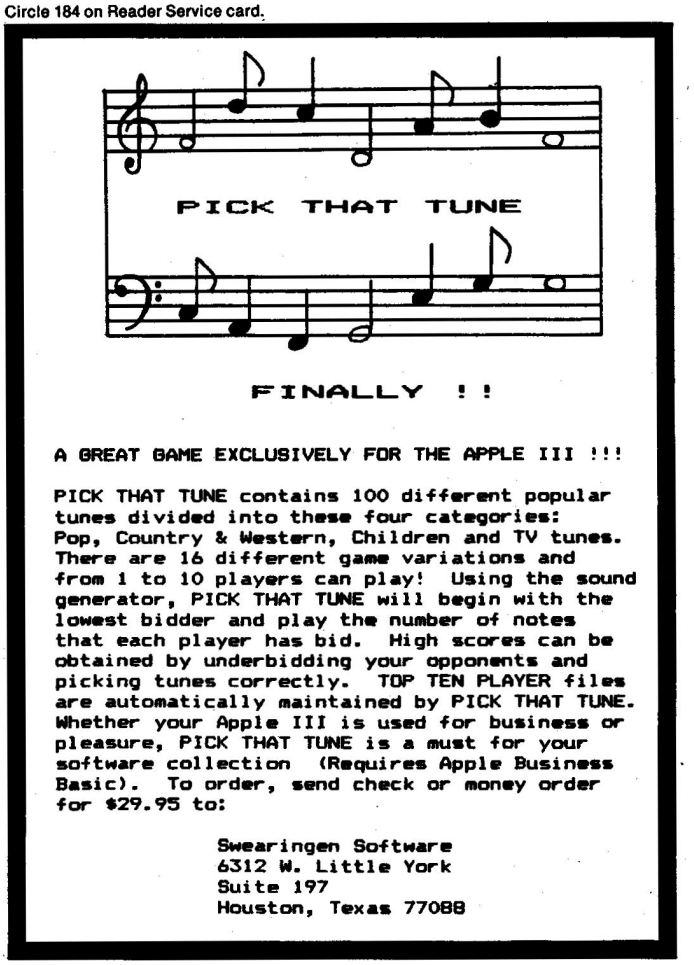

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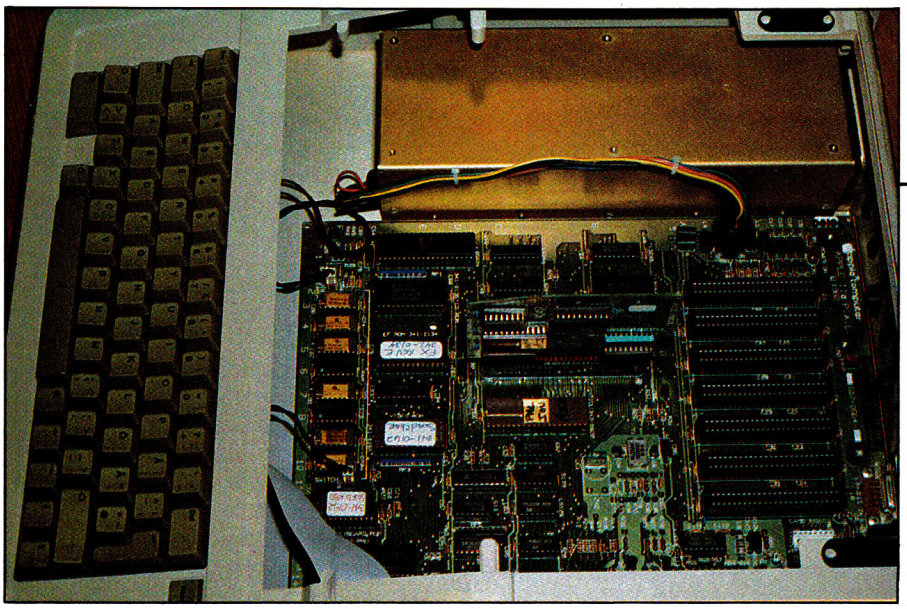

*Keys and interior design differ somewhat with the International model.*

| Type This | Program Executes This |
|---|---|
| Control-G | Speaker beeps |
| Control-J | Cursor moves down one line. If on line 24, screen scrolls |
| Control-K | Everything to the right of the cursor is deleted |
| Control-L | Screen cleared, cursor to Home position |
| Control-M | Cursor moves down to next lower line (as though you had pressed return) and screen scrolls if necessary |
| Control-N | Display is set to normal |
| Control-O | Display is set to inverse |
| Control-Q | Active-40 display |
| Control-R | Active-80 display |
| Control-U | Display switched to Inactive mode. Screen cleared, cursor to Home position |
| Control-V | Screen scrolls down one line. Cursor to Home position |
| Control-W | Screen scrolls up one line. Cursor to Home position |
| Control-Y | Cursor to Home position |
| Control-Z | The line the cursor is on is deleted |
| Control-\ | Nondestructive forward space. After column 79, cursor automatically returns to the first column. Also adds an automatic line feed when writing in Basic |
| Control-] | From cursor to end of line is deleted |

*Table 6. Control characters responsible for helpful functions.*

your two-key press won't be seen on the screen, but are stored in memory to be used during deferred execution of the program. You'll see the results when the program is run. (See Table 6.)

Some of these functions will work even if you don't have the card installed or it's inactive. (See Table 7.)

If you're programming in Pascal, a cursor positioning function is available. This keypress is control-~xy, which sends the cursor to a specified position on the screen. Your display screen is 80 columns by 24 rows, with 0,0 representing the top left corner. Enter your cursor coordinates after the tilde.

The only difference between the Standard and Extended 80-column text cards is the amount of memory available with each. To work with the latter, special switches must be set that substitute auxiliary memory for main memory. Actually, there are only 63K available bytes of RAM, as 1K is used for the 80-column video display. Naturally, if you only use a 40-column display, all 64K bytes are available for use.

The IIe's main memory has no space for the added memory on the card. The auxiliary memory is connected with the main memory in parallel via the address bus. To read and write to the card's memory, the IIe switches its data bus.

For display expansion, data from both the main and auxiliary memories is retrieved. Half of the display data for the 80-column display comes from main memory, the other half from auxiliary; the display circuitry fetches bytes of data from these two areas and displays them as adjacent characters. The 80-column display has twice as many dots as the 40-column display, and they are clocked out at 14 MHz, which makes the characters narrower and dimmer. The 40-column display clocks out its dots at 7 MHz. A television set cannot reproduce these characters clearly, as the dot patterns are too close together. A monitor with a bandwidth of at least 14 MHz is needed to produce a satisfactory 80-column display.

Controlling all of this bus switching is the MMU (Memory Management Unit). This is a specially designed integrated circuit, made specifically for the IIe. It is here that the soft switches are set by your programs, along with the logic circuitry that monitors the address bus and auxiliary memory switch.

Assembly-language subroutines control the auxiliary memory. These can be accessed from Basic statements via the Call statement. A Pascal program could link these subroutines as procedures or functions.

By reading or writing to the soft switches, you can select the mode you need. Switches have three memory locations. One turns the switch on, one turns the switch off, and the third reads the state of the switch. Table 8 gives the display-mode control in hexadecimal (for machine-language programs), decimal (for Peek and Poke commands accessed through Applesoft Basic) and negative decimal (Integer Basic).

You'll note that some are marked read or write. That's because keyboard data and strobe functions must share their locations with the soft switches. Use only the operation listed in the table. Those switches that aren't marked can be accessed by either a read or a write. Values don't matter. When you address the particular location, the switch functions—the value is ignored.

As stated before, half of the 80-column display is taken from main mem-

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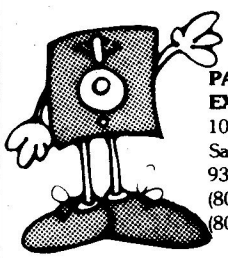

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ory. This data is stored in text Page 1 of main memory. The other half is stored in Page 1X of auxiliary memory, in the same locations. Bytes from these two locations are accessed and displayed sequentially, first from auxiliary memory, then from main memory. The odd columns of the display are stored in the main memory, and the even columns in the auxiliary memory. See Table 9 for a map of the 80-column display.

The switching methods are covered in the card's documentation, and a programmer who takes the time to digest that information should have little problem implementing the switching procedure from his or her programs.

### Documentation

Apple must be congratulated on much-improved documentation. Their *Owner's Manual* is definitely aimed at the novice computerist, and contains pertinent information on each page. The material is simply presented, and covers a varied assortment of topics.

Documentation for the Standard 80-column card is also well written. The text fully explains installation and use, and the tables are easy to understand. The same couldn't be said for the Extended 80-column card documentation, although to be fair, I must add that I've seen only a draft copy. Some of the material seems to be out of context, and a good deal more explanation is necessary for the complex subjects presented.

All in all, Apple has shown through their documentation that they truly are concerned about the consumer. The only material unavailable for review was the IIe reference manual, which I hope is as concise and informative as the documentation already mentioned.

### Recap

The Apple II user will find some of the IIe's features a little awkward at first, but the benefits far outweigh that inconvenience. Below are the differences between the Apple II and IIe.

- The IIe can print the full ASCII character set, so much of your Apple II software won't recognize, or take advantage of, the new characters.
- Since a dozen symbols are now moved to different positions, and the keyboard now has 63 keys, the Apple II typist will have to adjust to the changes.
- With the IIe, all control characters work with both uppercase and lowercase keystrokes. The Λ, the at-sign @, and the closing bracket ] are now on nonalphabetic keys to enable their use, regardless of the shift condition.
- Lowercase letters are not recognized by programs written to run under DOS, or in Basic. The exception is when the lowercase letters are found between quotation marks. The user must use *caps lock* or *shift* when writing DOS commands or Basic programs.
- Due to the auto-repeat feature, the user may inadvertently cause repeated characters. Fingers that rest too long on the keys could spell trouble.
- The *up-arrow*, *down-arrow*, *tab*, and *delete* keys are not recognizable by most programs written for the Apple II. Cursor movement keys as defined in a program's documentation should continue to be used.
- *Up-arrow*, *down-arrow* and *delete* are not recognized by UCSD Pascal 1.0 and 1.1, causing the display of unrelated characters. Control-O and control-L must be used for cursor movement, and deletions are accomplished in the usual manner.
- Disconnect, or turn off, hand controllers before pressing reset or turning on the power to your IIe. Failure to do so will cause a control-reset to invoke

| Type This | Program Executes This |
|---|---|
| Control-G | Speaker beeps |
| Control-J | Cursor moves down one line. If on line 24, the screen scrolls |
| Control-M | Cursor moves down one line (as though you had pressed the return key). Screen scrolls, if necessary |

*Table 7. These functions are still possible with an inactive card.*

*Table 8.*
*Soft switches order specific displays.*

| Name | | Function | Location Hex | Location Decimal | | Notes |
|---|---|---|---|---|---|---|
| Text | On: | Display Text | $C051 | 49233 | – 16303 | |
| | Off: | Display Graphics | $C050 | 49232 | – 16304 | |
| | Read | TEXT Switch | $C01A | 49178 | – 16358 | Read |
| Mixed | On: | Text With Graphics | $C053 | 49235 | – 16301 | 1 |
| | Off: | Full Graphics | $C052 | 49234 | – 16302 | 1 |
| | Read | MIXED Switch | $C01B | 49179 | – 16357 | Read |
| Page2 | On: | Display Page 2 | $C055 | 49237 | – 16299 | 2 |
| | Off: | Display Page 1 | $C054 | 49236 | – 16300 | 2 |
| | Read | PAGE2 Switch | $C01C | 49180 | – 16356 | Read |
| Hires | On: | Graphics Hi-Res | $C057 | 49239 | – 16297 | 1 |
| | Off: | Graphics Lo-Res | $C056 | 49238 | – 16298 | 1 |
| | Read | HIRES Switch | $C01D | 49181 | – 16355 | Read |
| 80Col | On: | Display 80 columns | $C00D | 49165 | – 16371 | Write |
| | Off: | Display 40 Columns | $C00C | 49164 | – 16372 | Write |
| | Read | 80COL Switch | $C01F | 49183 | – 16353 | Read |
| 80Store | On: | Store in Aux. Page | $C001 | 49153 | – 16383 | Write, 3 |
| | Off: | Store in Main page | $C000 | 49152 | – 16384 | Write, 3 |
| | Read | 80STORE Switch | $C018 | 49176 | – 16360 | Read |

**Legend:**

1) This mode is effective only when Text mode is off.
2) This switch has a different function when 80Store is on.
3) This switch changes the function of the Page2 switch for addressing the display memory on the Extended text card.

the built-in self-tests instead of the simple reset.

- Risk of an accidental reset has been minimized.
- New code is supported in the Monitor firmware, so calls to nonstandard places for Monitor routines may not work. Some functions may work differently, or not work at all.
- Text display and scrolling are slower in 80-column mode, because the 80-column firmware executes many more steps than when the program is in the 40-column mode.
- Since the characters in an 80-column display are smaller, the contrast controls of your monitor may have to be adjusted to give you a satisfactory display.
- Do not try to place a 16-pin hand controller into the 9-pin hand controller connector on the back panel. Use the white 16-pin connector found inside your IIe in front of the rf modulator connection.
- Use *either* the 9- or the 16-pin hand controller, never both at the same time.
- Due to the new rectangular openings in the back panel, an adapter may be needed to connect your peripheral device. A nut plate from the IIe's accessories kit may help connect a peripheral card if the device was manufactured by Apple Computer.
- Add-on cards that worked with your Apple II or II Plus should work with the IIe. Those that probably won't work are those cards that required installation into slot #0 (which no longer exists), or those that needed an extra connection on the main circuit board of the Apple II.
- Cards designed for the auxiliary slot can be inserted in an incorrect manner. Make certain the component side of the card is facing *away* from the power supply case.
- The IIe's self-tests can be run at any time, but if you have to run some other program before invoking the tests, unexpected values may be found in the main memory. This might cause the IIe to report an error, even if none exists. Turn off the computer, wait at least three seconds, and, while holding down the solid-apple key, turn the computer back on. An error message now indicates that your IIe may need servicing.
- When you reset the IIe, all 64K is fully reset; those programs or procedures that depend upon the upper 16K of memory not being reset may not work. You'll have to start the programs up again by rebooting.
- When using your 80-column card and Applesoft, comma tabbing beyond column 40 is possible if the programmer pokes location 36 with the desired location for each tab in turn.
- Due to the extra program steps that the 80-column card requires under UCSD Pascal, fast cursor movements may appear blurred.
- Be careful using or buying older programs, as the new Monitor firmware and applications programs perform a checksum routine. Some copy-protected programs and other software perform a checksum routine to verify that the computer is using the standard Apple II or II Plus Monitor, and will get an erroneous sum. The product won't run if such is the case.

In coming months, *inCider* will be delving further into the IIe. Articles dealing with the Extended 80-column card, the new Apple Writer II, Quick File II and hardware/software compatibility will be offered our readers. The IIe is definitely a marketable machine. The Apple II should be proud of its successor! ■

| Display Mode | Page | Lowest Address | | Highest Address | |
|---|---|---|---|---|---|
| 40-Column Text | 1 | $400 | 1024 | $7FF | 2047 |
| Low-Resolution Graphics | 2 | $800 | 2048 | $BFF | 3071 |
| 80-Column Text* | 1 | $400 | 1024 | $7FF | 2047 |
| Normal 280-Dot | 1 | $2000 | 8192 | $3FFF | 16383 |
| High-Resolution Graphics | 2 | $4000 | 16384 | $5FFF | 24575 |
| Optional 560-Dot* | 1 | $2000 | 8192 | $3FFF | 16383 |

*Note—These modes use locations in both main and auxiliary memory. The Page2 switch is used to select one or the other for storing data.

*Table 9. Video page address to call upon.*

# Apple Data— A Bumper Crop Part III

**In the first two parts of this series an assortment of data retrieval techniques have filed past. Now the third, and last, article adds another to the list and summarizes them all.**

by Peggy Burnett

Those of you who have followed this series so far already have the techniques you need to get data out of your files fast, using indexing. All you have to do now is learn how to apply these techniques. For newcomers I'll provide a brief review, so that you too can have indexed files.

### What an Index Does

First of all, let me tell you what an indexed file is. It's really two files working together (see Figure 1). One, called the *main file*, is the regular file full of data. It can be organized any old way—perhaps a sequential file (sorted or unsorted), or a direct access file of one kind or another. The other file, called the *index file*, is an index of the entries in the main file. It works just like the index of a book. The look-up in the index goes much faster than that in the book for two reasons: the index is well-organized, and the index is much smaller.

Not only does an index enable you to get to a record quickly, you can find the record via any of several keys. For example, if you have an employee social security number index, another employee name index, and an index of employees by job classification, you can look up the employee you want using whichever of these three indexes is most convenient. Note too, that all three of these indexes are on "natural" key values, which are easier for the user than computer-generated employee numbers would be.

One other nice feature of indexes is that you can usually use them to produce a sorted report by simply following the index from beginning to end. In the above example, you could print a list of employees alphabetically, by social security number or by job classification, without having to sort first.

### Why It Works

As I mentioned before, one of the reasons a look-up in an index goes faster than in the main file is because the index is smaller. While the main file must contain all the data about a key, the index usually contains only the key value and the record number in the main file where the data record can be found.

The other reason a look-up in an index can go fast is that an index file is organized specifically for fast look-ups, while a main file may or may not be. Let's look at some of the ways an index file can be organized.

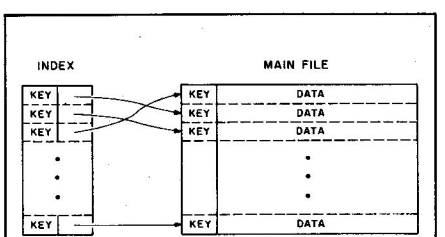


*Figure 1. General concept of an indexed file.*

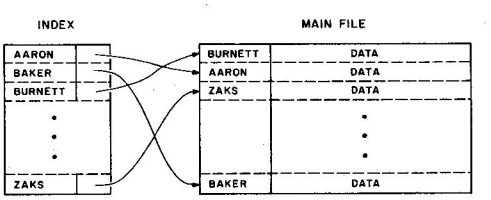


*Figure 2. An alphabetically-ordered dense index.*

*Peggy Burnett is a partner in the computer systems consulting firm of Bulgren and Burnett Inc., and specializes in applications of small computers. She holds an M.S. degree in computer science, and has been a data processing consultant to small businesses since 1972. Address correspondence to PO Box 1355, Lawrence, KS 66044.*

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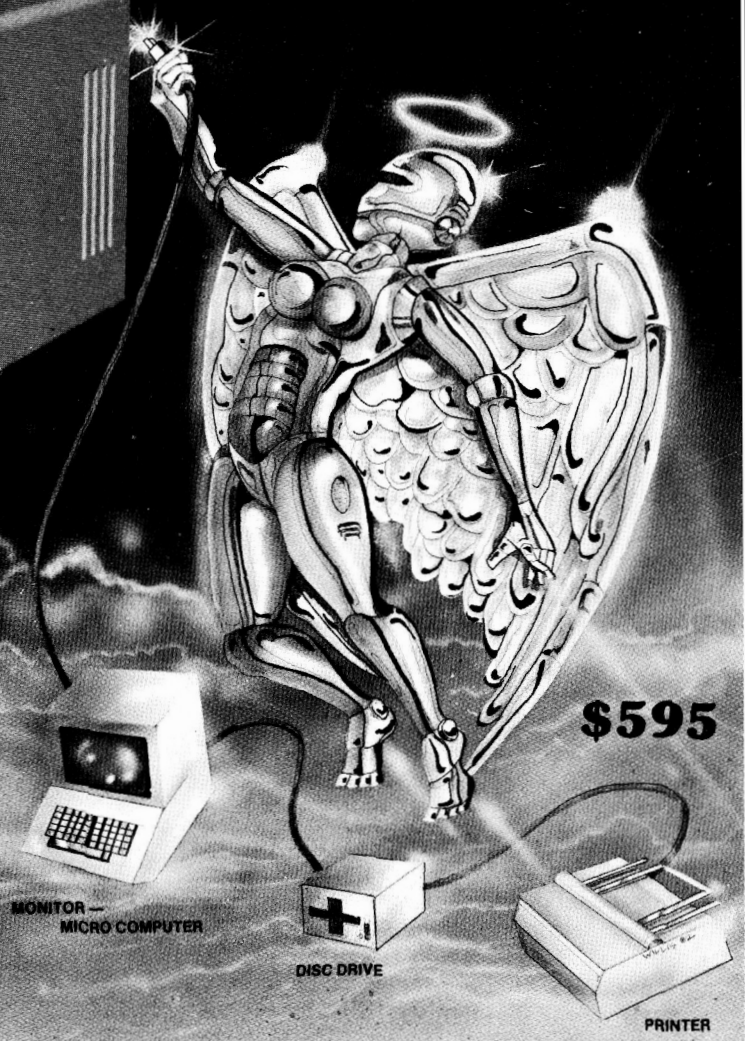


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### The Dense Index

In this, the most commonly-used kind of index, you simply have one entry in the index for every entry in the main file.

Figure 2 is a representation of a dense index. Notice in the picture that, although the entries in the index are arranged in order (in this case alphabetically), the entries in the main file aren't. This is the normal state of affairs when using a dense index. The organization of the main file can be whatever is convenient, even an unsorted sequential file, because you always do look-ups and reports via the index.

**"The organization of the main file can be whatever is convenient..."**

Even though you don't have to waste time sorting your main file, you do have to keep the index file sorted. The usual way to do this is to collect entries at the end of the index file as the user adds them. Then, when the user is finished, sort the new entries and merge the now-sorted group into the rest of the index file. This sort usually doesn't take long (a minute or two), since you have to sort only a few records at once.

So, a way to find data about a particular employee might be to look up his social security number in the social security number index, using the binary search or the interpolation search technique (for those of you who missed Part 1 of this series, the algorithms for these searches appear in Listings 1a and 1b), and then read the data record from the main file.

Here's an example, using an employee file indexed on social security number. The goal is to add two employees to the main file (and therefore to the index file, too). First, let's add an employee with social security number 123-45-6789. We follow this procedure:

1. Use the binary search technique to check the index, making sure the employee isn't already in the file.
2. Put the employee record in the main file.

| Type of File | Comments | Average Number of Accesses In a 1000-record File | |
|---|---|---|---|
| | | If record is in the file. | If record not in the file. |
| **SEQUENTIAL FILES** (see Part 1 of the series): | | | |
| Sequential search in an unsorted file. | Also suitable for tape files. | 500 | 1000 |
| Sequential search in a sorted file. | Also suitable for tape files. | 500 | 500 |
| Binary search in a sorted file. | | 11 | 11 |
| Interpolation search in a sorted file | Distribution of data in the file must be known. Principle can be adapted to some extent for tape. | 5 | 5 |
| Partitioned file (unsorted). | | 100 | 200 |
| **DIRECT ACCESS FILES** (see Part 2 of the series): | | | |
| Plain old ordinary direct access file. | The computer assigns the key value. | 1 | 1 |
| Linked list. | Used to organize your records in the order you want them. | 1 or more | 1 or more |
| Hashed file. | A formula is applied to the key value to compute the record's location. | 1½ | 3 |
| **INDEXED FILES:** | | | |
| Dense index. | One entry in the index for each one in the main file. Index is maintained in sorted order. | 8 | 7 |
| Improved Dense Index. | An additional array in memory serves as an index to the index file. | 2 | 1 |
| Hashed Index. | The index is a hashed file. | 2 | 1 |
| Sparse Index. | Not all the entries in the main file are contained in the index. Often used in conjunction with a linked list. | 3* | 2 |

*Three accesses to get to the first entry in the main file that applies.

*Table 1. Summary of file access methods covered in Parts 1 and 2*

| Advantages | Disadvantages |
|---|---|
| 1. Easy to program.<br>2. No extra storage needed. | 1. Very slow. |
| 1. Easy to program.<br>2. No extra storage needed.<br>3. Better than the sequential search in an unsorted file, if the record is not in the file. | 1. Slow.<br>2. File must be sorted whenever additions are made. |
| 1. Not difficult to program.<br>2. Quite fast.<br>3. No extra storage needed. | 1. File must be kept sorted. |
| 1. Fastest method for sorted sequential files.<br>2. No extra storage needed. | 1. File must be kept sorted. |
| 1. Easy to program.<br>2. File does not have to be sorted. | 1. Extra storage may be needed. |
| 1. Easy to program.<br>2. No extra storage needed.<br>3. Fast! | 1. "Natural" keys can't be used.<br>2. Storage management may be more complex. |
| 1. Very little extra storage needed.<br>2. Helps avoid sorts. | 1. More precautions must be taken in programs to keep links from getting all tangled up. |
| 1. Easy to program.<br>2. Fast. | 1. Wastes storage space.<br>2. Cannot produce ordered reports without sorting first. |
| 1. Relatively fast look-ups.<br>2. Sorted reports can be produced from the index without additional sorting. | 1. Index file must be sorted when new entries are added.<br>2. Additional programming. |
| 1. Very fast look-ups.<br>2. Sorted reports can be produced without additional sorting. | 1. Extra disk accesses to build the array at the beginning of the program.<br>2. More complex programming. |
| 1. Very fast look-ups.<br>2. Hashed index does not need sorting. | 1. Can't get ordered reports without sorting.<br>2. Some wasted storage space. |
| 1. Doesn't take up much space.<br>2. Can produce ordered reports without additional sorting. | 1. Not efficient for looking up individual records.<br>2. Extra programming to maintain the linked lists. |

*(see previous two issues) and in Part 3 (this month).*


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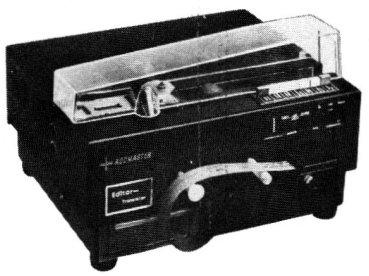

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## Search Algorithms for Sorted Index Files

The binary search algorithm, which can only be used on sorted files, checks the middle-most entry in the file to see if it is greater or less than the value of the one you are seeking. If it is greater, you only have to search the lower half of the file; if it is less, you only search the upper half. At this point, half the file has been eliminated with only one access! Repeat the procedure by checking the middle-most entry of the remaining half, eliminating half of that section the same way, and so on. This method takes $\log_2(n)$ accesses, where n is the number of entries in the file.

The interpolation search works the same way you do when finding a name in the telephone book. If the name starts with the letter Z, you head for the end of the book; if the name starts with an E, you look first near the beginning. If you find that you're looking in the wrong part of the book, you flip a few pages backward or forward and try again. This technique works only in a sorted file in which you know the approximate distribution of values.

```
PROCEDURE BINARY_SRCH (THE_ONE_WE_WANT, FOUND).
/* Uses the binary search technique to find THE_ONE_WE_WANT in
   the file.  Sets FOUND to true or false.  */

   LOWER = 1.
   UPPER = LAST_RECORD_IN_FILE.
   FOUND = FALSE.

   WHILE LOWER <= UPPER AND FOUND = FALSE DO
      MIDDLE = INTEGER ((LOWER + UPPER) / 2).
      READ MIDDLE RECORD.

      IF THE_ONE_WE_WANT > RECORD
         THEN LOWER = MIDDLE + 1.    /* Next time, try upper half */
      IF THE_ONE_WE_WANT < RECORD
         THEN UPPER = MIDDLE - 1.    /* Next time, try lower half */
      IF THE_ONE_WE_WANT = RECORD
         THEN FOUND = TRUE.
   END_WHILE.

END BINARY_SRCH.
```

*Listing 1a. The binary search algorithm.*

3. Add an entry onto the end of the index, consisting of the employee's social security number and the record number of his data record in the main file.

You'll notice that the data record is inserted first, then the index record. That way, there is never (not even for an instant) an index record pointing to an entry in the main file that isn't there.

Now let's add another employee, this time with social security number 111-22-3333.

1. Check the index again to be sure this employee isn't already there. To do this, use the binary search on the sorted part of the index, and then read sequentially the newly-added entries at the end of the index.
2. As before, put the employee record into the main file.
3. Then add the entry onto the end of the index.

When you're done adding employees, you can either sort only the new ones and merge them into the rest of the index, or sort the entire index file, using whatever sort utility program is available.

*Accesses*: If the main file contains 1000 records, each 128 characters long, and if the key to be used is social security number (nine characters long), then an entry in the index file will be only 13 characters long—nine for the key and four for the record number of the data record in the main file. This means that each 128-byte record will hold nine index entries. So this main file of 1000 employees would require an index file of 112 records.

To find an employee in this index using the binary search would take $\log_2$ (112) accesses, or about seven. Add one more access to read the data record from the main file, and we have a total

```
PROCEDURE INTERPOLATE (THE_ONE_WE_WANT, FOUND).
/* This procedure is written for a file (of at least 2 records)
   with evenly distributed values between 1 and 2000. */

   DEFINE FUNCTION INTERP_FCN (LO, THIS, HI)
                  = (THIS - LO + 1) / (HI - LO + 1).
   /* Returns the percent (in decimal form) of the distance
      through the section where this record should be. */
   END_FUNCTION.

   FOUND = FALSE.
   DONE = FALSE.

   /* Initialize section boundaries */
   LOWER = 1.
   UPPER = LAST_RECORD_IN_FILE.
   LO_VALUE = 1.
   HI_VALUE = 2000.

   WHILE NOT DONE DO
      SECTION_SIZE = UPPER - LOWER + 1.
      PERCENT = INTERP_FCN (LO_VALUE, THE_ONE_WE_WANT, HI_VALUE).
      RECORD_NUMBER = LOWER + INTEGER (PERCENT * SECTION_SIZE) - 1.
      IF RECORD_NUMBER < LOWER
         THEN RECORD_NUMBER = LOWER.
      READ RECORD RECORD_NUMBER.

      IF RECORD = THE_ONE_WE_WANT
         THEN DO
            FOUND = TRUE.
            DONE = TRUE.

      ELSE IF SECTION_SIZE < 2
         THEN DONE = TRUE.   /* THE_ONE_WE_WANT is not in the file */

      /* Else reset section boundaries and prepare to try again */
      ELSE IF RECORD < THE_ONE_WE_WANT
         THEN DO
            LOWER = RECORD_NUMBER.
            LO_VALUE = RECORD.   /* this record */
         ELSE DO
            UPPER = RECORD_NUMBER.
            HI_VALUE = RECORD.   /* this record */
      ENDIF.

   END_WHILE.

END INTERPOLATE.
```

*Listing 1b. The interpolation search algorithm.*

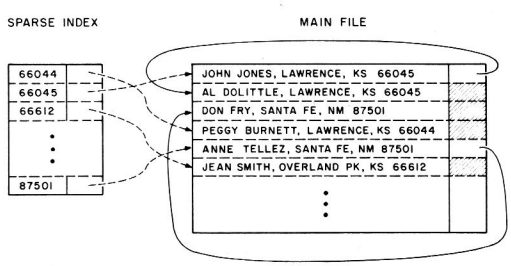


*Figure 3. A sparse index.*

of eight accesses to get the employee desired.

*Advantages*: This method features fast access to individual employees, plus the capacity to produce ordered reports without having to sort the main file.

*Disadvantages*: The index file takes up extra storage (112 records in the above example), requires additional programming to maintain, and has to be sorted whenever new employees are added.

## Improved Dense Index

In actual practice, there's a simple


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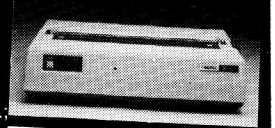

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## Algorithms for Use in Hashed Files

There are three things you need for a hashed file. First is a hashing formula to compute the location of a record from its key value. One hashing formula that is known to distribute values pretty evenly throughout a file in many cases is the MOD function (Listing 2a). You also need a way to determine if a location in your hashed index has an entry in it. You can do this by filling your index with all blanks when you first set it up (Listing 2b). Finally, if you are trying to add an entry that hashes to a location already occupied, just read sequentially from that location until you find an empty slot.

```
DEFINE FUNCTION MOD (KEY_VALUE, FILESIZE).

   MOD = REMAINDER (KEY_VALUE / FILESIZE).

END MOD.
```

*Listing 2a. The MOD hashing algorithm.*

```
PROCEDURE INIT_HASHED_FILE.
/* Initializes all records in a 168-record hashed index
   to 'available' */

   RECORD = '                                    '.  /* 128 blanks */

   FOR REC_# = 1 TO 168 DO
      WRITE RECORD AT RECORD NUMBER REC_#.
   NEXT REC_#.

END INIT_HASHED_FILE.
```

*Listing 2b. This algorithm initializes all the records in a hashed file, signifying their availability for data.*

improvement often made to the dense index that speeds it up. When your program starts to execute, the very first thing it does is to read the first entry of each index record into an array. In the above example, there were 1000 entries in the index, which required a total of 112 records. So the array would have 112 elements. The first element would be the first entry in index record #1, the second would be the first entry in index record #2, and so on.

Then, whenever you need to look up an employee, you first find him in the 112-element array, using the binary search. This tells you what index record to read, which in turn tells you what record in the main file contains the data—rather like an index to your index file.

*Accesses*: In the above example, the array will have to be read in at the beginning of your program for a total of 112 accesses, but that is done only once, not every time you look up an employee. Afterwards, look-ups will require only two disk accesses—one in the index file and one in the main file. (The looking-up in the array doesn't count, since it is in memory, not on disk.)

*Advantages*: This improvement over the regular dense index allows faster access during look-ups, without losing the ability to produce ordered reports.

*Disadvantages*: The programming is slightly more complex, and the array does have to be read in at the beginning of the program.

### The Hashed Index

This is really just another kind of dense index. Like the dense index above, there's one entry in the hashed index for every entry in the main file; and, like the above, the main file can be organized any old way. But, unlike the dense index, the hashed index is a hashed file (surprised?) rather than a sorted file. Hashed files were covered in detail in Part 2, but you can refresh your memory by glancing at Listings 2a and 2b.

The usual reason people choose this kind of index is that they really wanted to use a hashed main file, but didn't want to waste all that storage space. Recall from Part 2 that a hashed file needs to be kept about one-third to one-fourth empty to maintain its efficiency. In our 1000-entry employee file, the main file would have to be 1500 records long! If, instead, the main file is supported by a hashed index, only a 1000-record main file plus a 168-record index file is needed, for a total of only 1168 records.

Let's add those two employees to the file again. In this example, we'll use the MOD hashing function (Listing 2a), which computes the record's location in the index to be the remainder of the social security number divided by the index file size. Employee number 123-45-6789 will hash to record number 141 in the index, and employee number 111-22-3333 will be located in index record number 109.

So, for each employee we:

1. Check the index, using the hashing algorithm, to be sure the employee isn't already in the file.
2. Add the employee to the main file.
3. Add the employee to the index, using the hashing algorithm again.

Remember, it's not necessary to sort the index when you're done adding employees, because hashing doesn't need a sorted file to work.

*Accesses*: In almost all cases, you can find the employee in the index in one disk access, plus one more to get the data record from the main file.

*Advantages*: This method is very fast,

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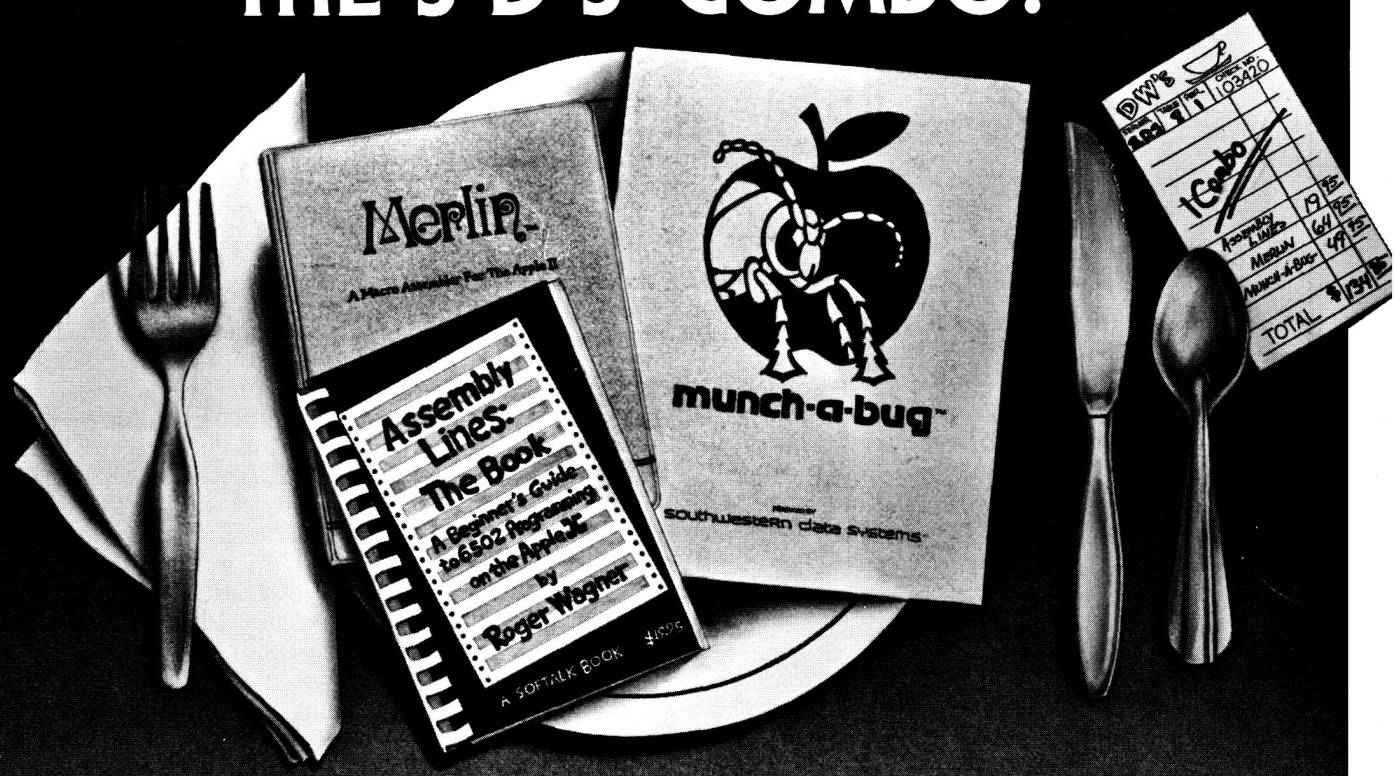


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is not nearly as wasteful of storage space as a hashed main file, and is not difficult to program. Also, the hashed index does not need to be sorted.
*Disadvantages*: Since the hashed index is not sorted, you can't get ordered reports from it without sorting.

### The Sparse Index

You can use a sparse index in conjunction with a linked list when you don't need an entry in the index for each and every entry in the main file. For example, let's consider Gooch Supply's mailing list file, which is indexed by zip code. Mr. Gooch finds it very useful to have a zip code index, because it allows him to print his labels in zip code order, thereby taking advantage of sorted mail postal rates.

Mr. Gooch's main file has 1000 customers in it, spread out over 189 different zip codes. Since there are only 189 different zip codes, it seems silly to have 1000 entries in the zip code index. Instead, each zip code appears only once in the index, and all customers with the same zip code are linked together in a list. There's a picture of this application in Figure 3.

Of course, Mr. Gooch doesn't use this index to look up individual customers—he has a customer name (dense) index for that purpose. But having the additional zip code index enables him to print labels in zip-code order, or for only selected zip codes, without having to use up valuable computer time and storage to sort.

The sparse index in this example is a sorted file, so it is maintained much like the dense index discussed earlier. However, since it contains only a few entries, look-ups will be even faster than in the dense index.

Time for another example—adding a customer to the file and, therefore, to the name index and, if necessary, the zip code index.
1. The user types in the customer data to be added.
2. Check the zip code index to see if the zip code is already in it. If so, the customer record needs a link to the (former) beginning of the list of customers who have this zip code. If the zip code is new, this customer will be the start of a new zip code list.
3. Write the new customer record in the main file, linked as described in step 2.
4. Add the customer to the customer name index.
5. If this is a new zip code, add it to the end of the zip code index.

When the user finishes adding customers, you'll need to sort the name index as before, and also the zip code index if any new zip codes were added to it.
*Accesses*: There are nine characters in the new improved version of zip codes, plus four more bytes for the record number in the main file of the data record, so nine index records can fit into a 128-byte record. This means the zip code index will be 21 records long. You could easily use the interpolation search on this index, since the distribution of zip codes in Mr. Gooch's file can be predicted. Hence, you could look up a zip code in the index in about two accesses.
*Advantages*: This type of index can produce ordered reports, but doesn't take up much space. It is usually employed in addition to some other type of index.
*Disadvantages*: This type of index isn't usually used for looking up individual records, since following the links through the main file adds considerably to the overhead.

### Summary

I have discussed several types of indexes, each of which has its own advantages and disadvantages. The dense index gives fast access to individual records, and can also be used to produce ordered reports. The improved version does the same things, only faster. The hashed index, which uses some additional storage, offers extremely fast access to individual records, but can't be used to produce ordered reports. Finally, the sparse index, which is often used with linked lists of records from the main file, can be used to produce ordered reports and takes up the least amount of storage of all the indexes. You can use the indexes as I presented them here, or combine them and tailor them to your own applications. Either way, they can help you get to your data fast, making your computer a more productive tool. ■

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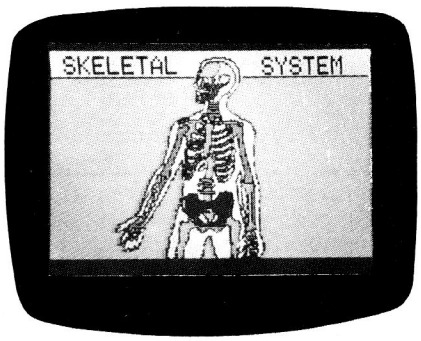


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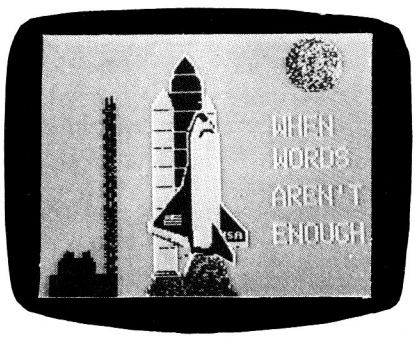


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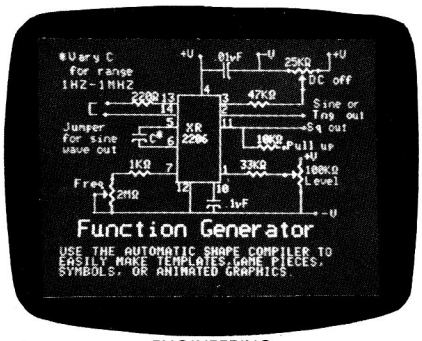


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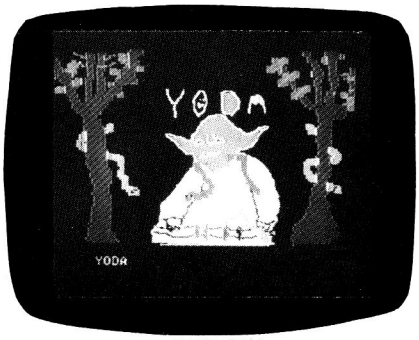


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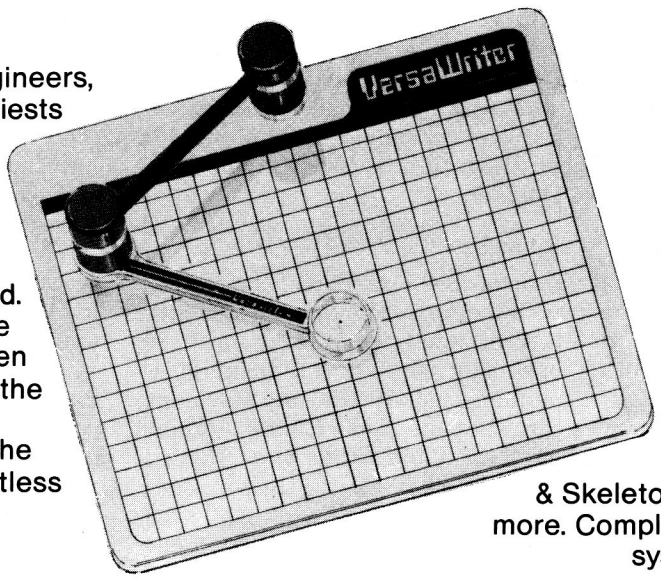


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# Comdex Report

**Our author traveled to Las Vegas for a first-hand look at the latest in Appleware.**

**by Barry D. Bayer**

Comdex was quite a show, but much of it was IBM oriented—including more IBM PC look-alikes than you could shake a stick at. Lotus Systems' 1-2-3, the combined spreadsheet, graphics and database program, and VisiCorp's VisiON, the Smalltalk-like executive work station software (complete with mice), are available for MS-DOS and the PC-alikes, but not for Apple.

### Hard Choice

There were, of course, products for Apple owners. From Apple Computer Inc. itself came the Duofile, a slim-line two-drive box containing more than 800K of storage per drive, on specially designed 5¼-inch floppies. It's now marketed only for the III but after the introduction of the (dare we say it?) IIe, Duofile will eventually become available for it, and for the II and II Plus. Of course with 5M hard disks coming down to $2500, $2000 and even less, 1.7K of storage on two mini-floppies is not quite as impressive as it would have been a couple of years ago.

But as one hanger-on was heard to say, "Buy a hard disk, and when you need another 5M you have to get another hard disk. Buy a Duofile, and when you need another 1.7M you just buy another couple of mini-floppy disks."

Of course some of the new hard disks have complete backup onto $50 or $100 cartridges, and you can presumably swap the backups in and out, depending on what you're doing. But I suppose that the Duofile does have some advantages. But will we need the Duofile and a standard Apple drive, also? And what of all of the (locked) software already existing for 140K drives—will it be transportable to the Duofile?

### Apple Sets the Pace

Speaking of standards, one problem with the Apple II industry today is the lack of standards in equipment. No one really knows how to build big expansion memory cards or 80-column cards because Apple Computer didn't build them and set the standards.

I am told that with or without a strap to the motherboard RAM, every 16K memory expansion card, today, works with the same control codes. Oh, some cards have their own F8 monitor ROM, while others use the ROM on the motherboard. Some cards permit hardware as well as software switching between motherboard and slot 0 card, while others can only switch in software, but all cards respond to the same codes to write enable, write protect, bank switch and the like—because Apple got there first.

Unfortunately, ACI has yet to market an 80-column card, or to produce a memory expansion card larger than 16K. With no standards to follow, each 80-column and 64K designer has done things his own way. So my preboot won't work with your memory expansion, and neither of our 80-column cards will work with the other guy's program. (This is particularly hard to understand, since virtually everyone's 80-column card works with Pascal. . . but I digress.)

The "locked" programs make things worse because, even if I knew enough to make the changes required to adapt to new products, I couldn't do them—I couldn't get into the program. Tell the author of a locked program that you want to make such changes, and he will tell you that you don't have the right to do it (copyright laws to the contrary notwithstanding) and ask how he could be expected to support the program and its operation after you have messed around with it.

With Apple's new IIe, we will for the first time be getting standards for 64K expansions and 80-column cards. (Why 64K when even 128K will be passé soon?) And maybe at that point some of the software that requires

*Address correspondence to Barry D. Bayer, Esq., PO Box 1506, 2842 Walnut Road, Homewood, IL 60430.*

**"Wouldn't it be nice to have a disk emulator for my Applewriter II files? You bet. Will I get it? Don't bet on that."**

more memory and 80 columns will become available. Of course you'll have to replace all of your nonstandard boards, but isn't that a small price to pay?

### Omega Fills the Gap

In the meantime, I have a perfectly good RAMEX128K memory expansion card (from my friend Dave Alpert at Omega Microware Inc., 222 S. Riverside Plaza, Chicago, IL 60606), with a perfectly good disk emulator package, which I can't use except on a school registration program I wrote for my wife. All because almost every other serious program I own is protected. Wouldn't it be nice to have a disk emulator for my Applewriter II files? You bet. Will I get it? Don't bet on that.

Of course, the RAMEX128K *does* have a use, highlighted by the announcement at Comdex of a third-level VisiCalc preboot that will permit 255K files (with two 128K boards) and most of the wonderful formatting (attribute) commands available on the advanced version of VisiCalc. Variable column widths, locked and hidden Cells, $ and , within numbers, lowercase (with most of the 80-column boards) and similar features will give your 202 or 208 version of VisiCalc the *feel* of the advanced version, and cost you considerably less money than a III or an IBM PC.

(After long arm twisting of the board's manufacturer, I got a promise that my favorite Advanced Logic Systems (ALS) built-in function, @ROUND, would also be incorporated.)

Just as the original VisiCalc sold a lot of Apples, I suspect that the Omega's new Enhancer Software will sell a lot of 128K RAM boards. (Yes, that's 255K with two boards, and supposedly loading the entire 255K file from two disks in less than 40 seconds. I haven't seen it yet, but the programmer's track record is good enough so that I believe it.)

### CP/M+

Other goodies for the Apple II included Advanced Logic Systems' new Z-card, with CP/M+, which was also announced at the show, and looked pretty slick for $400 retail. (Steve Wozniak was walking around the Comdex floor with an ALS badge on, confirming a story that he was becoming more actively associated with the company.)

**"...Omega's new Enhancer Software will sell a lot of 128K RAM boards."**

After talking with some of the folks at Digital Research and ALS, I find that CP/M+ seems to be a friendlier CP/M, and compatible with CP/M 2.2. (That is, anything running in 2.2 should run in CP/M+.) Imagine CP/M giving meaningful error messages, and not crashing an applications program into the system just because of some silly user error.

### And More

Personal Computer Products Inc. (16776 Bernardo Center Drive, San Diego, CA 92128) was showing the Appli-Card, a 6 MHz Z-80 card with 64K of RAM on board, with an add-on half-board for CP/M+.

CommSoft Inc. (2452 Embarcadero Way, Palo Alto, CA 94303) had its PhotoCaster "photography system" for the Apple II, which accepts black and white or color pictures from a camera, or an eight-second analog dump from a similarly equipped computer. The resolution looked good enough to iron on a T-shirt, and I'm sure that lots of those will be on the market soon.

I could go on and on about who and what was at Comdex, but with more than a thousand exhibitors, I can't cover everything. I hope I've at least given you the flavor of the show. You'll be seeing all of these products and more in the coming months. ■


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# Blaising Bibliographies

**Compiling information sources into an organized list can drive a writer to wrack and ruin. This article, the first in a three-part series, presents a program for using Pascal text editing to overcome the bibliography blues.**

**by James R. Florini**

Computers should do the dull jobs so people can concentrate on more interesting things. By far the dullest job I have to do is to prepare the bibliographies for the papers, grant applications, etc., that I write as part of my research activities. I've been using the Apple UCSD Pascal system as a text editor; with the Pascal printout formatting programs I have written, it meets all my word processing needs quite well. Apple doesn't make any fuss about this in their advertising, but if you have the Language Card—or if you own some other system that runs UCSD Pascal—you really don't have to spend several hundred dollars for a word processor.

*Address correspondence to Dr. James R. Florini, Biology Department, Syracuse University, Syracuse, NY 13210.*

```
                    REFERENCES CITED:

1. Brown and Brown, 1979          10. Jones and Smith, 1999
2. Brown, 1977                    11. Jones and von Dekker, 1999
3. Brown, 1978                    12. Konigsberg et al., 1981
4. Brown, 1979a                   13. La Whatever, 1982
5. Brown, 1979b                   14. O'Malley, 1975
6. Brownstein, 1978               15. Smith and Jones, 1982
7. De la Haba, 1975               16. Van Heusen, 1954
8. Ewton and Florini, 1981        17. Von Himple, 1943
9. Florini and Roberts, 1979      18. Where et al., 1983
                                  19. Who and What, 1999
```

*Figure 1. Test files analyzed.*

```
    This is a test of the REFCITED program (Smith and Jones, 1982), using
various types of citations (Who and What, 1999; Where et al., 1983).  It
should easily pick up Jones and Smith (1999), but not the duplicate Smith and
Jones (1982).  What about Florini and Roberts (1979) and Ewton and Florini
(1981).  Also another Florini and Roberts (1979); that should not appear
twice.  Konigsberg et al.  (1981) should also be found, in spite of the extra
space the Apple Pascal Editor inserts after a period.  And Jones and Smith
(1999) should be recognized as a duplicate.  Test it with de la Haba (1975),
O'Malley (1975), or la Whatever (1982).  If it gets those try Von Himple
(1943), van Heusen (1954), and Jones and von Dekker (1999).
```

*Figure 2a. Bibliographical list.*

```
                    FILE #5:test1.text
LINE  REF.        CITATION
 #     #            LISTED
  1     1. Smith and Jones, 1982
  2     2. Who and What, 1999
  2     3. Where et al., 1983
  3     4. Jones and Smith, 1999
  4     5. Smith and Jones, 1982
  4     6. Florini and Roberts, 1979
  5     7. Ewton and Florini, 1981
  5     8. Florini and Roberts, 1979
  6     9. Konigsberg et al. , 1981
  8    10. Jones and Smith, 1999
  8    11. de la Haba, 1975
  9    12. O'Malley, 1975
  9    13. la Whatever, 1982
 10    14. Von Himple, 1943
 10    15. van Heusen, 1954
 10    16. Jones and von Dekker, 1999
```

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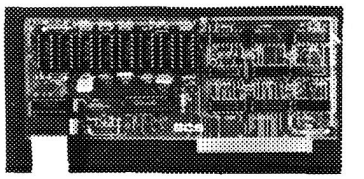

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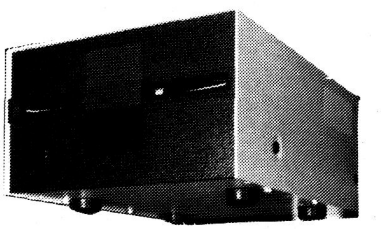

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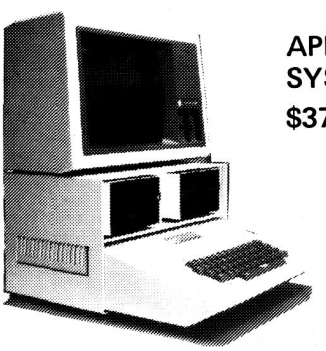

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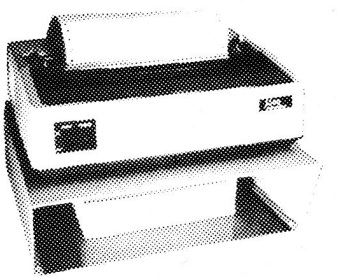

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# DREAMS DO COME TRUE

*Listing. REFCITED.*

```
CONST
    SPACES='                                                    '; {50 SPACES}
    REFLENGTH=50; MAXFILES=25; MAXCITE=150;
    {The following may require revision to suit your system configuration;
     the numbers here are for the Apple screen}
    SCREENCLEAR=12; HOME=19;

TYPE RIGHTSET=SET OF CHAR;    {For FUNCTION GET-CHAR}
     NODE_POINTER=^NODE;      {To be used in "TREE" for alphabetizing results}
     NODE=RECORD
            WORD: STRING;
            LEFTPTR,RIGHTPTR: NODE_POINTER;
          END;

VAR ROOT: NODE_POINTER;
    CITATION: STRING;
    CITELIST: PACKED ARRAY [1..MAXCITE] OF STRING[REFLENGTH];
    CHOICE: CHAR;
    CH: STRING[255];
    RESULT, PAGE, LIST, LINES, L, NUMFILES, J, R, X: INTEGER;
    DISKFILE, PRINTOUT: TEXT;
    FILENAME: PACKED ARRAY [0..MAXFILES] OF STRING [20];
    SEEKFILE, ENTRY: STRING[20];
    ALPHABETIZED: BOOLEAN;

{The following "Utilities" are declared "FORWARD" so they can be used in the
SEGMENT PROCEDURE; that must be the first code-generating part of the program.}

FUNCTION GET_CHAR (FIRST, SECOND: STRING; GOODSET: RIGHTSET): CHAR; FORWARD;
PROCEDURE CLEAR_SCREEN; FORWARD;

{The text of the instructions takes up a lot of memory; they are set up as a
 SEGMENT PROCEDURE to maximize memory available for program use after the
 instructions have been shown to the user.}
SEGMENT PROCEDURE INITIAL_INSTRUCTIONS;
VAR RESPONSE: STRING[2];

  PROCEDURE SECOND_HALF;
  {Two parts needed to keep within PROCEDURE length limits on the Apple II}
  BEGIN
    WRITELN
('    The program prints the text it is analyzing on the screen, so you can');
    WRITELN ('see just where it is at any given time..');
    WRITELN; WRITELN
('----> DON''T remove the diskette containing this program until told <----');
    WRITELN
('----> to do so; the program won''t work if you do. <----'); WRITELN;
    CHOICE := GET_CHAR ('Press (SPACE> to continue, <ESC> to quit','',[' ']);
    CLEAR_SCREEN;
    CHOICE := GET_CHAR ('List the bibliography in A)lphabetized order or',
    'in N)umerical order of appearance in the text? ',['A','N']);
    ALPHABETIZED:=CHOICE='A'; WRITELN;
    CHOICE:=GET_CHAR ('Will the Bibliography be P)rinted out',
     'or just S)hown on the console? ',['P','S']);
    CASE CHOICE OF
       'P': REWRITE (PRINTOUT,'PRINTER:');
       'S': REWRITE (PRINTOUT,'CONSOLE:');
    END;  WRITELN;
  END;  {SECOND-PART}

BEGIN
  WRITELN
('     This program extracts all reference citations (in the name, year');
  WRITELN
('format) from any text files you specify.   Up to ',MAXFILES,' files, in any');
  WRITELN
('drive, can be analyzed in any order you choose.  The references will be');
  WRITELN
('printed out when they are found, and a final list will be printed and ');
  WRITELN
('stored as file "CITELIST.TEXT" on the disk in drive #2 (volume #5).');
  WRITELN
('The program will pause at the end so you can insert a diskette in that');
  WRITELN ('drive for storage of the list.');
   WRITELN;
  WRITELN
('The program will remove any PREVIOUS CITELIST.TEXT  file from that disk,');
  WRITELN
('so be sure that the diskette you will use has enough blank space (8 to 16');
  WRITELN
('blocks) for the list, and doesn''t contain a list you want to save.');
 WRITELN; SECOND_HALF;
END;

FUNCTION GET_CHAR;  {Make the user get entries RIGHT! - also allow ESCAPE}
```

*Listing continued.*

The Pascal system, in addition to providing an excellent text editor, also allows analysis of the text in many ways. The most useful analysis I have devised is the one presented here; it prepares a complete list of all the references cited in as many as 25 text files, although I've never had occasion to do more than 15 or so. As far as I know, none of the commercial word processing programs can do this sort of analysis of the text, and they certainly don't allow you to modify things to suit your own needs to the extent that this Pascal program does.

To show how it works, examples of text files analyzed and the corresponding output are presented in Figures 1 and 2. The accompanying program (see the Listing) has been in use in my lab for almost two years. It has analyzed reference citations for half a dozen journal papers, at least four dissertations, and several grant applications. It seems to be pretty well debugged; it performs flawlessly in our hands. It works best for situations in which citations are specified in the "name, year" format, but it can be helpful even if the consecutive or alphabetical numbering system is used. In these cases, you just write the text with the "name, year" format, do all the editing, analyze the citations using the REFCITED program, and then convert all the "name, year" citations to numbers with the Pascal Editor R)eplace function just before the final printout of the manuscript.

## How It Works

Pascal is said to be "self-documenting," and Pascal programs are certainly easier to read than most Basic programs, but I think this program may be of more interest to report-writers than to experienced Pascal programmers. Besides, there are some places where you might want to customize it to fit your individual needs, so a little extra explanation seems necessary. To make my programs as easy as possible to read, I consistently designate procedures and functions with two words separated by an underline (and don't use this for anything else), so you can easily see when a Procedure is being called. I have included a reasonable

*Listing continued.*

```
VAR RESPONSE: CHAR;
BEGIN
  REPEAT
    WRITE (FIRST); IF SECOND<>'' THEN
    BEGIN
      WRITELN; WRITE (SECOND);
    END;
    READ (RESPONSE); IF RESPONSE=CHR(27) THEN EXIT (PROGRAM);
    IF RESPONSE IN ['a'..'z']
      THEN RESPONSE:=CHR(ORD(RESPONSE)-32);  {Make upper case}
    IF NOT (RESPONSE IN GOODSET) THEN WRITELN (CHR(7),
    '"',RESPONSE,'" IS NOT AN APPROPRIATE RESPONSE TO THIS QUESTION.'); WRITELN;
  UNTIL RESPONSE IN GOODSET; WRITELN;
  GET_CHAR:=RESPONSE;
END; {GET-CHAR}
PROCEDURE CLEAR_SCREEN;
BEGIN
  WRITE (CHR(HOME), CHR(SCREENCLEAR));
  WRITELN ('MEMORY AVAILABLE IS ':35,MEMAVAIL,' WORDS.');
  WRITELN; WRITELN;
END;

PROCEDURE TOP_PAGE;
VAR I: INTEGER;
BEGIN
  FOR I:=1 TO 4 DO WRITELN(PRINTOUT); L:=4;
END;
PROCEDURE BOTTOM_PAGE;
BEGIN
  WRITE (PRINTOUT, CHR(12)); TOP_PAGE;
END;
PROCEDURE TRY_IT (VOLNUM:INTEGER);
VAR THISONE: STRING[2];
BEGIN
  (*$I-*) STR (VOLNUM,THISONE); SEEKFILE:=CONCAT('#',THISONE,':',ENTRY);
  RESET (DISKFILE,SEEKFILE); RESULT:=IORESULT; (*$I+*)
END;
PROCEDURE SHOW_LIST;
VAR I: INTEGER;
    RESPONSE: STRING[2];
```

*Listing continued.*

number of comments, but I also wanted to keep the text file within the limits of Apple memory.

Insofar as Pascal allows, the program is arranged in the order in which it runs, although (as always in Pascal) it is a good idea to start analyzing it by looking at the Main Program at the end. The real action is in the READ_TEXT and READ_REF procedures; more on them later. First we have to get things organized.

After the instructions are read and choices are made (INITIAL_INSTRUCTIONS), the user is invited to enter the names of the files to be analyzed in GET_FILES. To make things as easy as possible for the Pascal neophyte, the volume prefixes and ".TEXT" suffix are added. If the file isn't present in any of the drives (as determined in CHECK_FILES), the user has a chance to correct the file name or to


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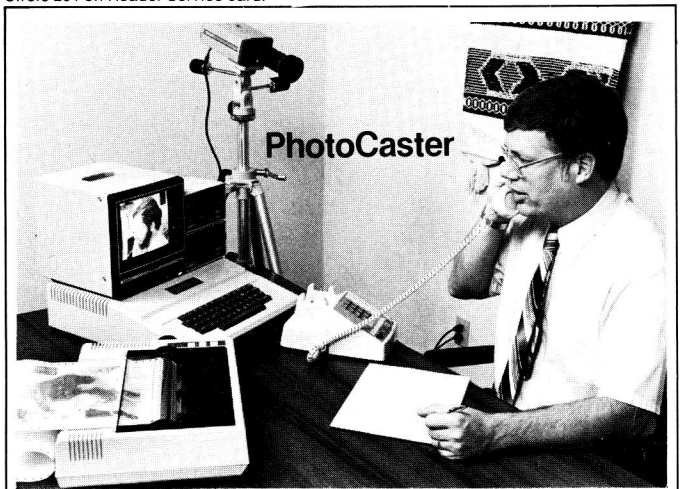


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insert the correct disk. Finally, the list of file names is displayed for final approval (SHOW_LIST) before the analysis is started. You might wish to enhance this program to allow entry of the file names from a text file or to make individual corrections of the file names on the final list.

At last, we get around to analyzing the text (READ_TEXT). The problem here is that the signal that a citation might be present (a semicolon or a close parenthesis) comes at the *end* of a citation, so the previous 50 characters must be available when this signal is found; furthermore, the citation might be divided by a line feed.

I solved these problems by moving a "window" of characters through the entire text file. This is done by reading a character at a time, accumulating them in string CH. When CH reaches the 250-character limit, it discards the first 200 characters and then starts adding with character #51. This sounds

*Listing continued.*

```
    PROCEDURE DRAW_LINE;
    BEGIN
      WRITELN
 ('-------------------------------------------------------------------------');
    END;
BEGIN
  CLEAR_SCREEN; WRITELN ('THESE FILES WILL BE ANALYZED:');
  DRAW_LINE;WRITELN
(' #                FILENAME   ');
  DRAW_LINE;WRITELN; FOR I:=1 TO NUMFILES DO WRITELN (I:2, FILENAME[I]:28);
  DRAW_LINE;
  WRITELN; WRITELN
('If correct, press <RETURN>; if not, enter any letter to quit.');
  READLN (RESPONSE); IF RESPONSE <> '' THEN EXIT (PROGRAM);
END;   {SHOW-LIST}

PROCEDURE ADD_TEXT;
VAR L: INTEGER;
BEGIN
  L:=LENGTH (ENTRY);
  IF (COPY(ENTRY,L-4,5)<>'.TEXT') AND (COPY(ENTRY,L-4,5)<>'.text')
       THEN ENTRY:=CONCAT(ENTRY,'.text');
END;
PROCEDURE CHECK_FILES;
BEGIN
  {The units tried here can be modified to suit the configuration of your
   system; this is set up for 3 disk drives and a Saturn card as Unit #10.}
  TRY_IT (10); IF RESULT<>0 THEN TRY_IT(5);
  IF RESULT<>0 THEN TRY_IT(11); IF RESULT<>0 THEN TRY_IT(4);
  IF RESULT<>0 THEN
  BEGIN
    CLEAR_SCREEN; GOTOXY(2,10);
    WRITELN (CHR(7), 'No file named ',ENTRY,' could be found in any drive.');
    WRITELN ('PLEASE ENTER A CORRECTED NAME FOR FILE # ',NUMFILES,':');
    READLN (ENTRY); ADD_TEXT; CHECK_FILES;
  END ELSE BEGIN  {RESULT=0}
            writeln ('Found ',seekfile);
            FILENAME[NUMFILES]:=SEEKFILE;CLOSE (DISKFILE);
          END;
END; {CHECK FILES}
```

*Listing continued.*


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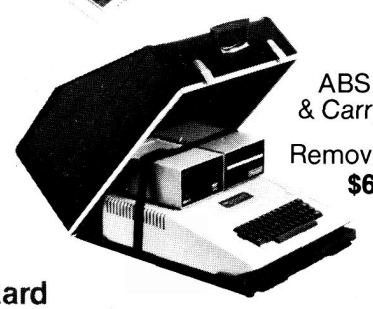

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*Listing continued.*

```
PROCEDURE GET_FILES;
VAR I: INTEGER;
BEGIN
  NUMFILES:=0; WRITELN; WRITELN;
  WRITELN ('Now enter the names of the files to be analyzed by this program.');
  WRITELN
  ('DO NOT specify the volume name (or number) or enter the "text" suffix. ');
  WRITELN; WRITELN
  ('Press <RETURN> after each entry, and just press <RETURN> with no entry');
  WRITELN ('when all file names have been entered.');
  REPEAT
    NUMFILES:=NUMFILES+1; IF NUMFILES=MAXFILES THEN WRITELN (CHR(7),
       'THIS IS THE LAST FILE THAT CAN BE ENTERED!');
    WRITELN; WRITELN ('What file will be number ',NUMFILES,'? ');
    READLN (ENTRY);
    IF ENTRY<>'' THEN
    BEGIN
      ADD_TEXT;CHECK_FILE; WRITELN;
    END;
  UNTIL (ENTRY='') OR (NUMFILES=MAXFILES);
  IF NUMFILES<MAXFILES THEN NUMFILES:=NUMFILES-1;
END;        {GET-FILES}

{The following are necessary to avoid a complete loss if the number of
 citations exceeds MAXCITE}
PROCEDURE PREPARE_FILE; FORWARD;
PROCEDURE PRINT_ALPHABETICAL; FORWARD;
PROCEDURE PRINT_NUMERICAL; FORWARD;

PROCEDURE ADD_ALPHABETICAL(ITEM: STRING; VAR POINTER: NODE_POINTER);
BEGIN
  IF POINTER=NIL THEN {START A NEW NODE}
    BEGIN
      NEW(POINTER);POINTER^.LEFTPTR:=NIL;POINTER^.RIGHTPTR:=NIL;
      POINTER^.WORD:=ITEM; LIST:=LIST+1;
      IF LIST>=MAXCITE THEN
      BEGIN
        WRITELN (CHR(7),
          'THIS BIBLIOGRAPHY IS TOO LONG TO PROCESS IN ONE PIECE!');
        PREPARE_FILE; PRINT_ALPHABETICAL; EXIT (PROGRAM);
      END;
    END
  ELSE {LOOK FURTHER IN THE TREE}
    BEGIN          {How's THIS for recursion?!}
      IF ITEM>POINTER^.WORD
        THEN ADD_ALPHABETICAL (ITEM,POINTER^.RIGHTPTR);
      IF ITEM<POINTER^.WORD
        THEN ADD_ALPHABETICAL (ITEM,POINTER^.LEFTPTR);
    END;
END;   {ADD-ALPHABETICAL}

PROCEDURE ADD_NUMERICAL (ITEM: STRING);
VAR I:INTEGER;
BEGIN
  IF LIST>0 THEN
  BEGIN  {If it's already there, exit; otherwise add it to the list}
    FOR I:=1TO LIST DO IF ITEM = CITELIST[I] THEN EXIT(ADD_NUMERICAL);
    LIST:=LIST+1; CITELIST[LIST]:=ITEM;
  END ELSE
  BEGIN   {Enter the first one}
    LIST:=1; CITELIST[1]:=ITEM;
  END;
  IF LIST>=MAXCITE THEN
  BEGIN
    WRITELN (CHR(7),'THIS BIBLIOGRAPHY IS TOO LONG TO PROCESS IN ONE PIECE!');
    PREPARE_FILE; PRINT_NUMERICAL; EXIT (PROGRAM);
  END;
END;  {ADD-NUMERICAL}

PROCEDURE READ_REF;
VAR Y, Z : INTEGER;
    ONENAME: BOOLEAN;

   PROCEDURE FIND_CAPITAL;
   VAR LETTER: CHAR;
   BEGIN
     REPEAT
       Y:=Y+1; LETTER:=CH[X-Y];
     UNTIL (LETTER IN ['A'..'Z']) OR (Y=REFLENGTH);
   END;   {FIND_CAPITAL}

   PROCEDURE CHECK_PREFIX;
   VAR TEST: STRING[4];
   BEGIN  {Add any necessary provision for your "favorite authors" here}
      {First line takes care of "Mc", "O'", and similar written-solid names}
      IF (CH[X-Y-1]<>' ') AND (CH[X-Y-1]<>'(') THEN FIND_CAPITAL ELSE
      BEGIN  {look for a separate prefix}
        IF COPY (CH, X-Y-6,6)='de la ' THEN
        BEGIN
```

*Listing continued.*

(and indeed *is!*) cumbersome, but Pascal runs so fast that the letters stream across the screen at quite a good rate.

Whenever a possible citation is found (i.e., when either ")" or ";" appears in the text), READ_REF takes over. First it looks for "19"; all the references I cite were written in this century, but a medieval scholar might have to change the acceptable date. Then follows a bit of processing to discover whether one or two names must be found. Next, the appropriate number of capital letters is found by reading back into CH as Y is incremented. This would be simple if everyone were named Smith or Jones (or even Florini), but the O'Malleys, Nadal-Ginards and de la Habas I cite forced me to make additions to this part of the program. Your citations may include other names that require further additions to CHECK_PREFIX to pick them up.

When all of this is done, Y will equal the length of the citation, so the program reads the new citation from the CH string by the command CITATION: = COPY (CH,X-Y,Y). This citation is then printed (or shown on the console, if that's what you specified), any obvious typos corrected (such as the spaces added at the end of a line, for example), and the beautiful new citation added to the alphabetical or numerical list by the appropriate ADD_... procedures.

Following the example of the APPLE3:CROSSREF program, I used a binary tree to alphabetize the list.

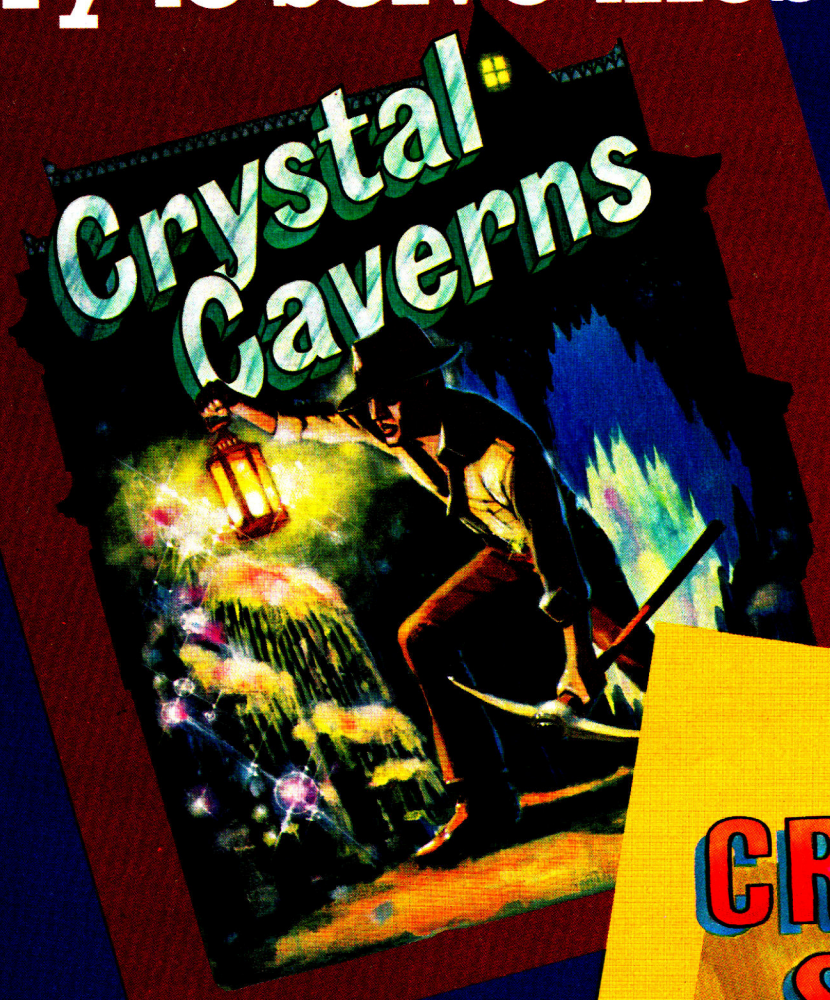
```
    This is the second file of citations.  It has some duplicates of the
first file (such as Florini and Roberts, 1979), and a bunch of similar names
(Brown, 1977; Brownstein, 1978; Brown, 1978; Brown, 1979a; Brown, 1979b; and
Brown and Brown, 1979).  All of these should be picked up as separate
citations and properly alphabetized.  The "a's" and "b's" at the end of the
year (as in Brown, 1979a) would have to be removed if CITELIST is to be used
to key a Bibliography printout.
```

FILE #5:test2.text

| LINE # | REF. # | CITATION LISTED |
|---|---|---|
| 2 | 17. | Florini and Roberts, 1979 |
| 3 | 18. | Brown, 1977 |
| 3 | 19. | Brownstein, 1978 |
| 3 | 20. | Brown, 1978 |
| 3 | 21. | Brown, 1979a |
| 3 | 22. | Brown, 1979b |
| 4 | 23. | Brown and Brown, 1979 |
| 6 | 24. | Brown, 1979a |

*Figure 2b. Bibliographical list.*

# Think you're smart? Try to solve these tonight.

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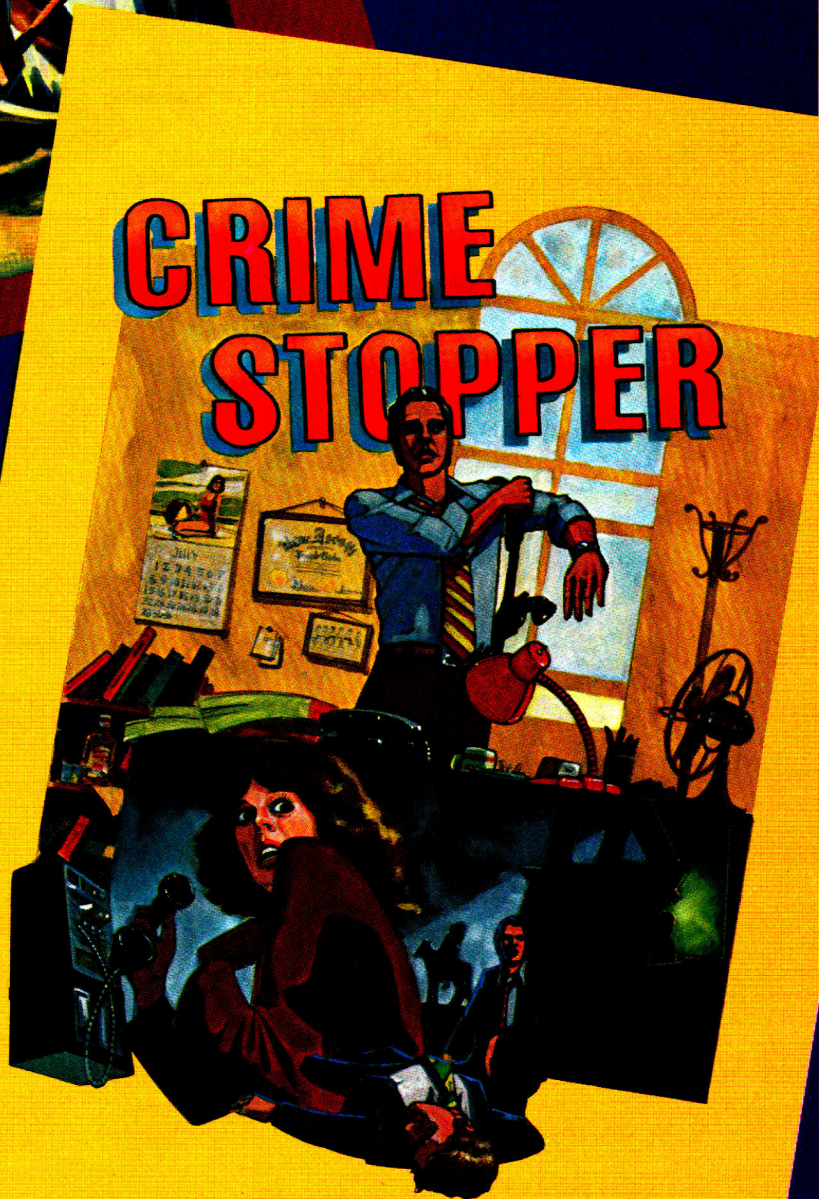


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*Listing continued.*

```
          Y:=Y+6; EXIT(CHECK_PREFIX);
        END;
        TEST:=COPY(CH,X-Y-4,4); IF (TEST='Von ') OR (TEST='von ')
          OR (TEST='Van ') OR (TEST='van ') THEN
        BEGIN
          Y:=Y+4; EXIT(CHECK_PREFIX);
        END;
        TEST:=COPY(CH,X-Y-3,3); IF (TEST='de ') OR (TEST='la ')
          OR (TEST='le ') THEN Y:=Y+3;
      END;
    END;  {CHECK-PREFIX}

PROCEDURE FIND_HOWMANY;  {One author or two specified in the citation?}
VAR LETTER:CHAR;
BEGIN
  ONENAME:=((COPY(CH,X-12,5)='et al') OR (COPY(CH,X-13,5)='et al'));
  IF ONENAME THEN EXIT (FIND_HOWMANY);  {No need to look further}
  Y:=0; FIND_CAPITAL; CHECK_PREFIX;  {Get to beginning of second name}
  IF (COPY(CH,X-Y-5,5)=' and ') OR (COPY(CH,X-Y-6,5)=' and ')
    OR (COPY(CH,X-Y-2,3)=' & ') OR (COPY(CH,X-Y-3,3)=' & ')
      THEN ONENAME:=FALSE ELSE ONENAME:=TRUE;
END;  {FIND-HOWMANY}
  PROCEDURE REMOVE_TYPOS;  {This can save a lot of trouble}
  VAR I, L: INTEGER;
  BEGIN
    I:=1; L:=LENGTH(CITATION);
    REPEAT        {Remove "~", spaces, erroneous ". ,"}
      IF CITATION[I]='~' THEN CITATION[I]:=' ';
      IF I < L-1 THEN
      BEGIN
        IF (COPY(CITATION,I,2)='  ') THEN DELETE (CITATION,I+1,1);
        IF I < L-2 THEN
          IF COPY(CITATION,I,3)='. ,' THEN DELETE (CITATION,I+1,1);
        IF I < L-10 THEN
          IF COPY(CITATION,I,6)='et al,' THEN INSERT ('.',CITATION,I+5);
      END;
      I:=I+1;
    UNTIL I = L;
  END;   {REMOVE-TYPOS}

BEGIN   {MAIN READ_REF}
  IF CH[X-1] IN ['a'..'f'] THEN Z:=1 ELSE Z:=0;  {FOR 1972a-type references}
  IF COPY(CH,X-Z-4,2)='19' THEN          {It's probably a citation}
  BEGIN
    IF CH[X-Z-5]='(' THEN      {CONVERT " (19XX" TO ", 19XX" for printout}
    BEGIN
      CH[X-Z-5]:=' '; CH[X-Z-6]:=',';
    END;
    FIND_HOWMANY; Y:=0; FIND_CAPITAL; CHECK_PREFIX;
    IF NOT ONENAME THEN
    BEGIN
      FIND_CAPITAL; CHECK_PREFIX;
    END;
    CITATION:=COPY(CH,X-Y,Y); {Get the completed citation}
    WRITELN (PRINTOUT,LINES:3,R:5,'. ', CITATION); L:=L+1; REMOVE_TYPOS;
    IF ORD (CITATION[1])>90    {CHANGE LOWERCASE TO UPPERCASE INITIAL LETTER}
      THEN CITATION[1]:=CHR(ORD(CITATION[1])-32);
    R:=R+1; IF ALPHABETIZED THEN ADD_ALPHABETICAL(CITATION, ROOT)
       ELSE ADD_NUMERICAL(CITATION);
  END; IF L>55 THEN BOTTOM_PAGE;
END;  {READ_REF}

PROCEDURE READ_TEXT;
VAR Y: INTEGER;
    LETTER: CHAR;

  PROCEDURE LINE_END;
  BEGIN
    IF EOF(DISKFILE) THEN EXIT (READ_TEXT);
    WRITELN; LINES:=LINES+1; READLN(DISKFILE);
    IF LINES MOD 24=0 THEN
    BEGIN
      PAGE:=(LINES DIV 24)+1; WRITELN (PRINTOUT,'PAGE ',PAGE,':'); L:=L+1;
      WRITE (CHR(HOME), CHR(SCREENCLEAR));
      WRITELN ('   NOW ON PAGE ',PAGE,' IN ',FILENAME[J],
       ', WHICH IS FILE #',J,'; TOTAL # IS ',NUMFILES,'.'); WRITELN;
    END;
    IF (CH[X]<>' ') OR (CH[X]<>'-') THEN {to avoid writing solid}
    BEGIN
      X:=X+1; CH[X]:=' '
    END;
  END;  {LINE-END}

BEGIN         {MAIN READ_TEXT}
  CH:=CONCAT(SPACES,SPACES,SPACES,SPACES,SPACES);  {Make 250-blank line}
  X:=0;
  WRITELN (PRINTOUT, 'LINE  REF.        CITATION ');
  WRITELN (PRINTOUT, ' #     #          LISTED ');
  WHILE NOT EOF (DISKFILE) DO
```

*Listing continued.*

Forming the numerical list is simple; the program just checks for duplicates, and if none is found, adds the new citation to the end of the list.

Both ADD__ procedures have provision for aborting the analysis and printing out the partial list if MAXCITE is reached; it would be a shame to lose all that accumulated information. I'm not sure just how big MAXCITE can be made without exceeding the available memory; 150 has been quite enough for all of my uses.

When all of the files have been analyzed, the program checks for sufficient space on the disk in drive 2 and then prints out the final list of citations; this list is also recorded on disk. I took great care here to make sure that the list was not lost through some I/O error; short of a power failure, I don't think there is any way CITELIST can be lost. For example, I *didn't* use GET__CHAR in PREPARE__FILE because pressing escape would then abort the program. After all this, we certainly don't want to lose the list of citations by accidentally touching escape—the reset hazard is bad enough!

### Entering the Program

The text file for this program is rather long; it occupies 34 blocks in its present format. Thus it is necessary to use the Command-level "Swapping" option or to break the text into two parts and use a (*$I #5:REFCITED2*) command to get the second part. I prefer the first approach because it makes it easier to correct typos that turn up when the program is being compiled.

The text and instructions are set up on the assumption that you have some sort of 80-column arrangement (imperative for word processing); if you don't, you will probably want to shorten the prompt lines to fit your format. The constants HOME and SCREENCLEAR might have to be changed to suit your particular machine configuration; the ones given in the program are for the Apple screen. I have tried to avoid any special features of the Apple implementation of UCSD Pascal, so the program should run on any machine which uses the UCSD system.

### Using the Program

I have attempted to make the pro-

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gram as "user-friendly" as possible, but I am frequently surprised at the way people misunderstand my *perfectly clear* instructions; let me know if anything seems fuzzy to you. The program opens with a screenful of instructions, then asks you to make some choices about the kind of analysis and output to be used. (You will get the disk CITELIST.TEXT output even if you don't have the printer operate during the analysis.)

As the first part is a SEGMENT PROCEDURE, the program disk must not be removed until this part is finished.

Then the disks with the text files are inserted, and the file names entered (without volume names or ".TEXT" suffix, to make things as easy as possible). At this point, the program checks that the specified file is actually present in some disk drive before going on to the next entry; this saves a lot of wasted running time if there are entry errors or the wrong disks are present.


Circle 198 on Reader Service card.

*Listing continued.*

```
    BEGIN
      IF NOT EOLN(DISKFILE) THEN  {Avoid value range errors}
      BEGIN
        X:=X+1; READ (DISKFILE,LETTER); WRITE (LETTER); {echo to screen}
        CH[X]:=LETTER; {Conversion from STRING[1] to CHAR needed for READ}
        IF ((CH[X]=')') OR (CH[X]=';')) AND (X>=12) THEN READ REF;
      END ELSE LINE END;
      IF X>=250 THEN
      BEGIN  {Regenerate the line, saving the last 50 characters}
        DELETE (CH,1,200); X:=50;
        CH:=CONCAT (CH,SPACES,SPACES,SPACES,SPACES);
      END;
    END;          {NOT EOF}
  END;    {READ_TEXT}

  PROCEDURE PREPARE_FILE;
  VAR ERROR: INTEGER;
      PRESS: CHAR;

    PROCEDURE SHOW_ERROR;
    BEGIN
      IF ERROR = 8 THEN
      BEGIN
        WRITELN
      ('There is not enough space on the diskette for the CITELIST file; put a')
        WRITE('disk with at least ');
        IF LIST<75 THEN WRITE ('10') ELSE WRITE ('18');
        WRITELN (' empty blocks in drive #2, then press <RETURN>.');
      END ELSE
      BEGIN
        WRITELN ('ERROR #',ERROR,' HAS OCCURRED; SEE PAGE 133 OF THE LANGUAGE');
        WRITELN ('REFERENCE MANUAL TO SEE WHAT IS WRONG; CORRECT IT, AND THEN');
      END;
      WRITELN ('PRESS <SPACE> TO CONTINUE.');
      READ (PRESS);
    END;  {SHOW-ERROR}

  BEGIN  {MAIN PREPARE-FILE}
    CLEAR_SCREEN;
    WRITELN ('Insert a diskette for storage of "citelist" in Drive #2;');
    WRITELN ('when that is done press <SPACE> to complete the program.');
    READ (PRESS);
    REPEAT  {Get the storage file opened properly; don't want to lose it!}
      (*$I-*)IF LIST < 75 THEN REWRITE (DISKFILE,'#5:CITELIST.TEXT[10]')
        ELSE REWRITE (DISKFILE,'#5:CITELIST.TEXT[18]'); (*$I+*)
      ERROR:=IORESULT; IF ERROR<>0 THEN SHOW_ERROR;
    UNTIL ERROR=0;
  END;  {PREPARE-FILE}
  PROCEDURE PRINT_NUMERICAL;
  VAR I: INTEGER;
      FILENAME: STRING[20];
  BEGIN
    BOTTOM_PAGE; WRITELN (PRINTOUT,'REFERENCES CITED:':35);
    FOR I:=1 TO LIST DO
    BEGIN
      WRITELN (PRINTOUT,I:3,'. ',CITELIST[I]);
      WRITELN (DISKFILE,I:3,'. ',CITELIST[I]);
      IF I MOD 55=0 THEN BOTTOM_PAGE;
    END;
  END;  {PRINT-NUMERICAL}

  PROCEDURE PRINT_ALPHABETICAL;
  VAR L: INTEGER;

    PROCEDURE PRINT_TREE (POINTER: NODE_POINTER);
    BEGIN
      IF POINTER<>NIL THEN
      BEGIN
        PRINTTREE(POINTER^.LEFTPTR);
        BEGIN
          L:=L+1;WRITELN (PRINTOUT, L:3,'. ',POINTER^.WORD);
          WRITELN (DISKFILE, POINTER^.WORD);
          IF L MOD 55=0 THEN BOTTOM_PAGE;
        END;
        PRINT_TREE(POINTER^.RIGHTPTR);
      END;
    END;  {PRINT_TREE}

  BEGIN  {MAIN PRINT-ALPHABETICAL}
    BOTTOM_PAGE; WRITELN (PRINTOUT,'REFERENCES CITED:':35);
    WRITELN (PRINTOUT);
    L:=0;PRINT_TREE (ROOT);WRITE (CHR(7));
  END; {PRINT-ALPHABETICAL}

  BEGIN {MAIN PROGRAM}
    CLEAR_SCREEN; INITIAL_INSTRUCTIONS;
    L:=0; R:=1; ROOT:=NIL; LIST:=0;
    WRITELN ('====> THE PROGRAM DISKETTE CAN BE REMOVED NOW AND REPLACED');
    WRITELN
```

*Listing continued.*

*Listing continued.*

```
    ('      BY ONE OR MORE DISKETTES WITH THE FILES TO BE ANALYZED. <===');
  GET_FILES; SHOW_LIST;
  FOR J:=1 TO NUMFILES DO
  BEGIN
    (*$I-*)        {AVOIDS FATAL I/O ERROR IF FILENAME WRONG}
    RESET (DISKFILE,FILENAME[J]);  {OPENS FILE FOR READING}
    (*$I+*)
    IF IORESULT<>0 THEN          {IF FILENAME NOT CORRECT}
    BEGIN
      WRITELN (PRINTOUT, ' ':25,'FILE ',FILENAME[J],' NOT FOUND.');
      WRITELN ('>>>>>>>>>>',FILENAME [J],' NOT FOUND. <<<<<<<<<<')
    END ELSE
    BEGIN
      LINES:=1; CLEAR_SCREEN; WRITELN; WRITELN (PRINTOUT);
      WRITELN (PRINTOUT,'            FILE ',FILENAME[J]); CLEAR_SCREEN;
      WRITELN ('::::::::::::: NOW ANALYZING ',FILENAME [J],' :::::::::::::');
      READ_TEXT;   {THIS is where the action is}
      WRITELN; WRITELN ('************ FINISHED ANALYZING ',
        FILENAME[J],' ************')
    END;
    CLOSE(DISKFILE); {FINISHED WITH THIS FILE, READY FOR NEXT}
    WRITELN
  END;
  WRITE (CHR(7)); PREPARE_FILE;
  IF ALPHABETIZED THEN PRINT_ALPHABETICAL ELSE PRINT_NUMERICAL;
  WRITELN ('################### OUTPUT COMPLETED ######################');
  CLOSE (DISKFILE, LOCK); CLOSE (PRINTOUT);
END.
```

When all entries are complete, just press return with no entry, check the list of files, and let it run.

To reassure you that something is happening, the text being read is mirrored to the screen. Each 24 lines is designated a new page; that's the screen size on many monitors. These page and line numbers are also printed in the output, which makes it easy to correct typos in the citations in the text files. When everything is done, the Apple beeps, and you are given a chance to insert a new disk (in case your text disk was too full to accept the CITELIST file), the computer checks to make *certain* there is enough free space on the disk, and the alphabetized or numerical list is printed out and also stored on disk. I was conservative in specifying the length for the CITELIST file. The blocks reserved for the file will accommodate 75 (or 150, in the second case) citations of 50 characters each; of course citations are rarely that long.

I use the CITELIST.TEXT file as the basis for a complete printout of the bibliography from a library of references I have accumulated by recording them on disk the first time I cite them. The REFPRINT program also has the nice feature of formatting the reference listing to suit the idiosyncrasies of the various journals in which I publish my papers—but that program will have to be the subject of a later article. Even without it, the REFCITED program can be a big help in your writing activities. ■

Circle 8 on Reader Service card.

Hello, Noah here. Recently I got a contract to build this fellow a large boat. It seems he wants to collect two of each animal and make a floating zoo of some sort. So, in order to keep track of all the building materials and converting everything to cubits like he said, I got a minicomputer. But, with all this rain we have had lately, the power to my computer has been terrible. Every day for the last 39 days I have lost data every time the light blinked. So I got a **MAYDAY** Uninterruptible Power Supply from SUN RESEARCH up there in New Hampshire. Takes all the surges and spikes out of the line and keeps me running during those blackouts. So now I can keep track of all the animals and how many of each I have (those rabbits will drive you foolish) and keep track of all the different supplies (those elephants will eat you out of house and home). I have also hooked my phone system into the **MAYDAY** so I can keep track of incoming calls during those blackouts. The Boss gets really angry when He can't get through...more lightning. I was building this boat in my cellar, but the wife got tired of moving it around and said, "Get that ark out of here." "Ark". I kind of like that name.

So get a **MAYDAY**...for Heavens sake!

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# Spreadsheet Problem Solving

**The author shows how a simple ranking system can be adapted for your special use.**

**by Archie Mason**

There is among authors a well-known phenomenon known as "writer's block," a dreaded panic that banishes thought when a writer faces a white sheet of paper in the typewriter. This has not changed over the years, except that now it is often the blank staring eye of the word processor CRT that remains empty of creative input.

I'm lucky. I work for InterCalc, the spreadsheet user's group, and we encourage our members to write in and ask us for a solution to a problem, or to develop a matrix to perform a certain function. Thus I'm rarely at a loss for a project, and the subject of this first article came from such a request.

A member wrote us that he wanted a simple procedure for ranking a column of numbers, to find the first, second, third and fourth, and to be dynamic so a change in one of the numbers immediately produced a new ranking. He did not tell us what he would be using it for, so as an illustration we developed a scoring system that would act like a scoreboard, showing dynamically who was in the lead during a series of games.

The model will work on VisiCalc, or SuperCalc, or any program that has the @MAXimum function—this is the ability to scan a series of numbers and come back with the largest. Even the relatively new user to spreadsheet programs will be able to understand the model, and then adapt the principles to a specific use that he or she has in mind.

Figure 1 shows the scoreboard screen display—during a game series this would inform spectators and players how the series stands. Figure 2 shows the area in which the operator enters the game scores as they become available; it's important to note that games not yet played appear as blanks and not zeros—you'll see why in a minute. Off to the right is a simple total of the row, thus giving the accumulated score for each player.

All the interesting stuff happens in Figure 3. There are two columns under each of the place headings. The first column brings down the current total from above. An asterisk appears opposite the top scorer. The formula that produces this is

@IF(B23 = @MAX(B23...B31),1,0)

with the format set at asterisk. What this does is probably obvious—the formula compares each current points total with the whole column of scores and, if it is equal to the largest, it enters a 1; if not, it enters a zero (which of course shows nothing in the location, as in the case of Fred's score). This formula is replicated down the column, with the @MAX range unchanged. Bob is in first place so far.

The next column eliminates the top scorer, with the formula

@IF(C23 = 0, B23,0)

This evaluates C23, the last formula result and, if it is zero (indicating that it was not the @MAX value), it brings forward the score. If it finds something other than a zero, it inserts a zero in this location. As a result, Bob's score in this column is zero.

The next column uses a formula similar to the first:

@IF(D23 = @MAX(D23...D31),2,0)

It evaluates the last column, seeking the top score, and, when it finds it, inserts a 2 in the asterisk's location; so Betty is in second place. The other col-

```
* * * * * * * * * * * * *
*                       *
* CURRENT     STANDINGS *
*   AFTER GAME: 6       *
* ********************* *
*         POINTS  RANK  *
* Fred        88        *
* Tom         46        *
* Bill        76        *
* Mary       124 ***    *
* Betty      147 **     *
* Eliza       64        *
* Bob        240 *      *
* Jerry      112 ****   *
* CHARLES     91        *
*                       *
* * * * * * * * * * * * *
```

*Figure 1. The Scoreboard display.*

*Write to Archie Mason c/o InterCalc, PO Box 254, Scarsdale, NY 10583. A stamped self-addressed envelope will speed a reply.*

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Circle 50 on Reader Service card.

umns in the work area alternate these two formulae, giving third and fourth place.

Of course, this would have been enough to identify the current standings, but I thought a scoreboard would make the whole thing classier and less confusing. The formulae in the scoreboard area are fairly simple. Just bring down once again the accumulated points from the top area, and then for the RANK column add the asterisk columns in the format C23 + E23 + G23 + H23—anyone who is unplaced will have zero asterisks, and of course the first four people get the total of their asterisks brought over.

Finally, just to add a frill, you can identify which game you are up to, and this is why you don't want zeros across the top for unplayed games. The formula in the location AFTER GAME: is @COUNT(B6...K6) set flush left. Count the entries across the row and bring back the count. Remember that if the first player in the list (you only use this line) gets no points in a game, you must enter a zero or the count will be wrong.

Well, there it is—a simple ranking system that can be adapted for all kinds of things. If there is to be a single ranking column in a larger model you are developing, then position the ranking system off to the right or above in spare space, and take the figures to be ranked out to it and bring back the result. You will have probably deduced that I used the asterisk system, instead of the values 1, 2, 3 or 4, so that you didn't get zeros against unplaced scores. You can also see that with more columns you could have ranked every player up to ninth position. ■

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | RANKING AND SCOREBOARD SYSTEM | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | GAME | GAME | GAME | GAME | GAME | GAME | GAME | GAME | GAME | GAME | | |
| 4 | PLAYERS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | TOTAL | |
| 5 | | | | | | | | | | | | | |
| 6 | FRED | 3 | 3 | 3 | 55 | 5 | 19 | | | | | 88 | |
| 7 | TOM | 7 | 8 | 5 | 6 | 4 | 16 | | | | | 46 | |
| 8 | BILL | 6 | 9 | 6 | 4 | 7 | 44 | | | | | 76 | |
| 9 | MARY | 9 | 7 | 4 | 7 | 66 | 31 | | | | | 124 | |
| 10 | BETTY | 6 | 66 | 8 | 8 | 50 | 9 | | | | | 147 | |
| 11 | ELIZA | 5 | 8 | 7 | 4 | 7 | 33 | | | | | 64 | |
| 12 | BOB | 44 | 0 | 9 | 88 | 8 | 91 | | | | | 240 | |
| 13 | JERRY | 3 | 9 | 66 | 2 | 22 | 10 | | | | | 112 | |
| 14 | CHARLES | 66 | 4 | 9 | 1 | 11 | 0 | | | | | 91 | |
| 15 | | | | | | | | | | | | | |

*Figure 2. The game results entry area.*

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |
| 21 | | FIRST | | SECOND | | THIRD | | FOURTH | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | FRED | 88 | | 88 | | 88 | | 88 | | | | | |
| 24 | TOM | 46 | | 46 | | 46 | | 46 | | | | | |
| 25 | BILL | 76 | | 76 | | 76 | | 76 | | | | | |
| 26 | MARY | 124 | | 124 | | 124 | *** | 0 | | | | | |
| 27 | BETTY | 147 | | 147 | ** | 0 | | 0 | | | | | |
| 28 | ELIZA | 64 | | 64 | | 64 | | 64 | | | | | |
| 29 | BOB | 240 | * | 0 | | 0 | | 0 | | | | | |
| 30 | JERRY | 112 | | 112 | | 112 | | 112 | **** | | | | |
| 31 | CHARLES | 91 | | 91 | | 91 | | 91 | | | | | |
| 32 | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | |

| | | |
|---|---|---|
| * | * | * |
| * | CURRENT STANDINGS | * |
| * | AFTER GAME: 6 | * |
| * | | * |
| * | POINTS | RANK * |
| * | FRED 88 | * |
| * | TOM 46 | * |
| * | BILL 76 | * |
| * | MARY 124 | *** * |
| * | BETTY 147 | ** * |
| * | ELIZA 64 | * |
| * | BOB 240 | * * |
| * | JERRY 112 | **** * |
| * | CHARLES 91 | * |
| * | | * |

*Figure 3. The work area.*


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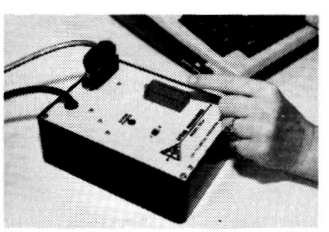

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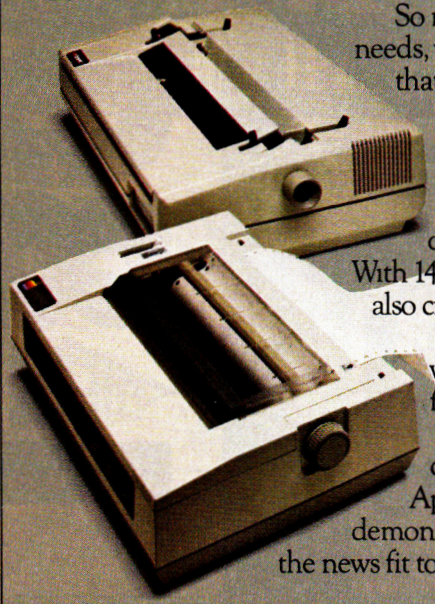

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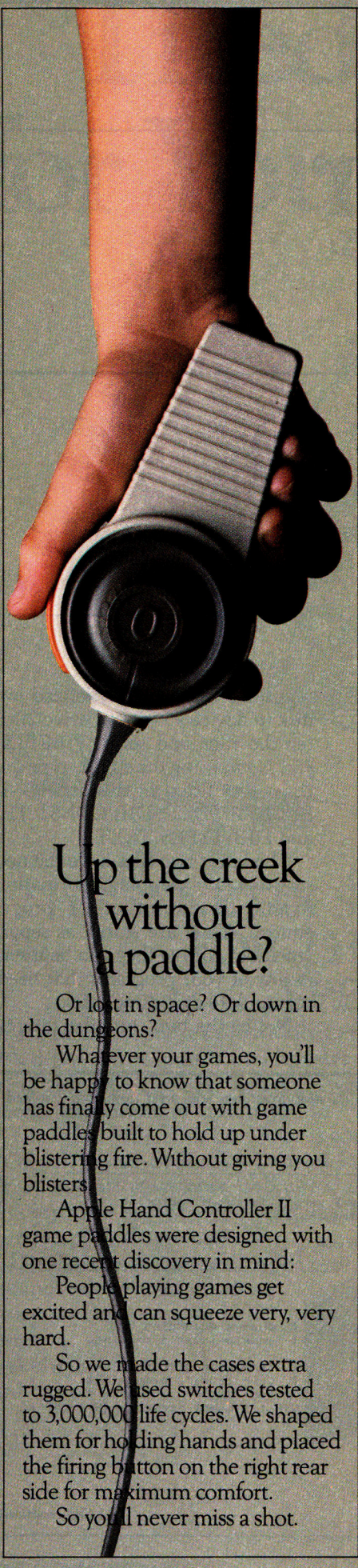

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As for quality and reliability, you need only store one word of wisdom:

Apple.

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Good tidings for crunchers of numerous numbers:

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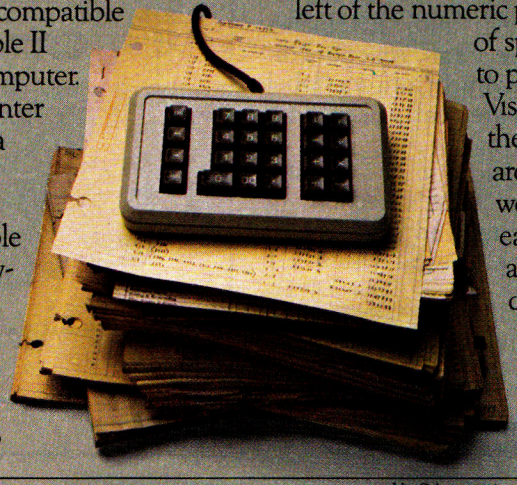

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# Labeller

**No more lost disks!
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by John Stephenson

Have you ever hunted through your disks wondering where you saved a file? Program Labeller can help organize your disks.

Most of my Pascal disks contain programs and files dedicated to a specific purpose, expressed by the disk volume name. For example, a disk called MODEM: contains communication programs; a disk called UTIL1: contains program development and debugging aids; and a disk called CONSULT: contains contracts and proposals. Despite this organization I have often had to hunt through the directories of several disks when I forgot where I saved a file.

The Labeller program eliminates the guesswork by printing an alphabetized file listing of each disk on a self-stick label. The labels I use are the pin-feed mounted kind, 1.5 inches high and 4 inches across. An entire directory will usually fit on one label since file names are neatly packed together on single lines.

To compile and run the labeller program, follow these directions (a two-drive configuration is assumed): Bring up the Apple Pascal System 1.1 as usual. Place an initialized work disk in device #5 (slot 6, drive 2). Enter the filer and select P)REFIX as #5:. Now, using the editor, type in the three files listed in this article—LABELLER.TEXT, DIR/CONST.TEXT and DIR/TYPES.TEXT.

**"The Labeller program eliminates the guesswork by printing an alphabetized file listing of each disk."**

The latter two files have the necessary memory-mapping information to handle directories under program control. They are stored as separate "include" files so they can be inserted in any of your programs that need to manipulate disk directories.

Notice the two compiler directives

*Listing. Program to read Apple Pascal ver. 1.1 disk directories and print formatted pin-feed labels.*

```
program LABELLER;
{------------------------------------------------------------------------}
{                                                                        }
{       Program to read Apple Pascal ver. 1.1 disk directories           }
{       and print formatted pin-feed labels.                             }
{                                                                        }
{       copyright 1982 John Stephenson                                   }
{                                                                        }
{------------------------------------------------------------------------}

const

LINES_PER_INCH          = 08;           {  change according to          }
CHARS_PER_INCH          = 12;           {  your printer's settings      }

LABEL_WIDTH             =  4.0;         {  change according to          }
LABEL_HEIGHT            =  1.5;         {  your label's dimensions      }

TITLE                   = 'Apple Pascal Ver 1.1 Label Formatter/Printer';

{$Idir/const.text}

type

{$Idir/types.text}
```

*Listing continued.*

*Address correspondence to John C. Stephenson, 9118 Smith Ave., North Bergen, NJ 07047.*

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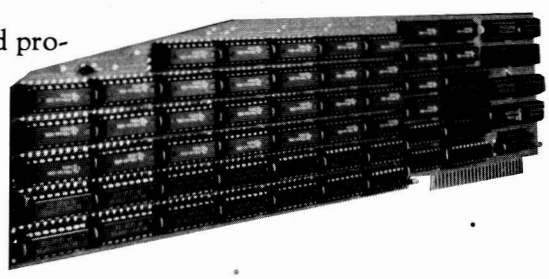

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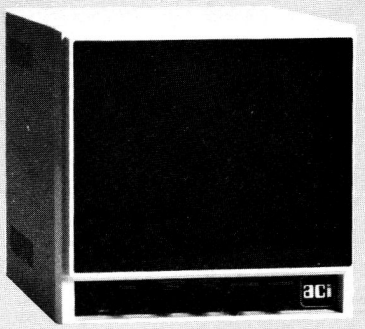


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*Listing continued.*

```
LABEL_LINES             = array [DIR_RANGE] of string;

var

CATALOG                 :DIRECTORY;
LINE                    :LABEL_LINES;
I                       :integer;
DONE_WITH_PROGRAM       :boolean;

{-------------------------------------------------------------------------}
{       Procedure to center string S at vertical position V               }
{-------------------------------------------------------------------------}

procedure CENTER (V:integer; S:string);

const

SCREENWIDTH             =79;            { RANGE 0..79 }
TOPLINE                 = 0;
BOTTOMLINE              =23;

var

H                       :0..SCREENWIDTH;

begin
if (V<TOPLINE) then V:=TOPLINE; if(V>BOTTOMLINE) then V:=BOTTOMLINE;
H:=1 + ((SCREENWIDTH-length(S)) div 2);
gotoxy(H,V); writeln(S)
end   {procedure CENTER};


{-------------------------------------------------------------------------}
{       Function to return value 0..9.  <ret> or <space> retuns 0.        }
{-------------------------------------------------------------------------}

function DIGIT:integer;
var
CH                      :char;
NUMBERS                 :set of char;

begin
NUMBERS:=['0'..'9'];
repeat read (keyboard,CH)
 until ((CH=chr(32)) or (CH=chr(13)) or (CH in NUMBERS));
if not (CH in NUMBERS) then CH:='0';
DIGIT:=ord(CH)-ord('0');
end   {function DIGIT};

{-------------------------------------------------------------------------}
{       Procedure to pack file names into single lines                    }
{-------------------------------------------------------------------------}
procedure COMBINENAMES;

const

SEPARATOR               = ' ; ';

var

FILE_NAME               : array[DIR_RANGE] of string[TID_LENG];
ENTRY_NUMBER,
LINE_NUMBER,FILES_LEFT  : DIR_RANGE;
MAX_LINE_LENG,
I,J,
LINES_TO_PRINT,
LINES_EACH_LABEL        :integer;

procedure ADD (NAME:string);

begin {ADD}
if (length(LINE[LINE_NUMBER])=0) then LINE[LINE_NUMBER]:=NAME
else
  begin
  if ((length(LINE[LINE_NUMBER])+length(SEPARATOR)+length(NAME))
   <=MAX_LINE_LENGTH)
   then LINE[LINE_NUMBER]:=concat(LINE[LINE_NUMBER],SEPARATOR,NAME)
  else
    begin
    LINE_NUMBER:=LINE_NUMBER+1; LINES_TO_PRINT:=LINES_TO_PRINT+1;
    LINE[LINE_NUMBER]:=NAME
    end
  end;
end   {ADD};

begin {COMBINENAMES}
for I:=1 to MAX_DIR do begin FILE_NAME[I]:=''; LINE[I]:='' end;
FILES_LEFT:=CATALOG[0].D_NUM_FILES;
ENTRY_NUMBER:=0;
LINE_NUMBER:=1;
LINES_TO_PRINT:=0;
MAX_LINE_LENG:=round (LABEL_WIDTH * CHARS_PER_INCH);
if (FILES_LEFT > 0) then
  begin
  repeat
    begin
    ENTRY_NUMBER:=ENTRY_NUMBER+1;
    if(length(CATALOG[ENTRY_NUMBER].D_TID)>0) then
      begin
      FILES_LEFT:=FILES_LEFT-1;
      FILE_NAME[CATALOG[0].D_NUM_FILES - FILES_LEFT] :=
       CATALOG[ENTRY_NUMBER].D_TID;
      end;
  end
until (FILES_LEFT<1);
if (CATALOG[0].D_NUM_FILES > 1) then
```

*Listing continued.*

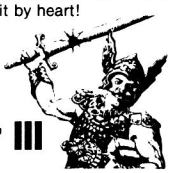
# A Galaxy of Great Games

## LOST COLONY

By David Feitelberg from Acorn
You are the Economic Manager of the world's first space colony. The next support ship from Earth isn't due for another **15 years**, and you have instructions to make things go better or get out of office in shame. You must allocate labor, explore new territories, decide on production quotas, determine pay scales and taxes for the most productivity. You're armed with maps and charts. 10 levels of difficulty; "save the game" feature on disk.
**Atari:** 40K Disk/ **IBM:** 48K Disk/
**TRS-80:** 16K Tape or 32K Disk,
**$29.95**

## MASTERTYPE

From Lightning
Imaginative and fun, this "space typing" game will teach you the keyboard in SELF DEFENSE! The only way you can defend yourself against the letters coming at you from all corners of the screen is to press each matching letter quickly. As the pace picks up, they're flying so fast, ***there's no time*** to look at the keyboard—you'll ***have to*** learn it by heart!
**Apple:** 48K Disk,
**Atari:** 32K Disk, **$39.95**
**IBM:** 64K Disk



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From Infocom
You can communicate ***in complete English sentences*** in these interactive adventures, with a vocabulary of over 600 words! Each of these literate games will keep you entertained for 50 hours or more.
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**Apple:** 48K Disk/**Atari:** 32K Tape or Disk/**TRS-80:** 16K Tape or 32K Disk,
**$29.95**

## VOYAGER I

From Avalon Hill
You're on board a spaceship infested with killer robots in this graphic science fiction game. You must clear the 4-level 144-location ship of robots and arm it to self-destruct. Can you do it and escape before you, too, are blown up? High-speed graphics are represented in 3-D perspective representing your eye's view; with instant switching to floor plan maps.
**Apple:** 48K Disk, **$24.95**
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**Apple:** 48K Disk, **$24.95**
**Atari/Color/ TRS-80:**
16K Tape, **$19.95**

## CROSSFIRE

From On-Line
The most original, exciting arcade game—designed exclusively for the home computer—that we've seen! The aliens have taken over your city, and everyone left peaceably—***except you.*** You wander the streets, shooting at aliens firing at you ***from all 4 directions.*** You must move quickly to avoid their CROSSFIRE, gather bonus tokens, and recharge your laser. It's one of our favorites! Requires Joystick.
**Apple:** 48K Disk, **$24.95**
**Atari:** 16K Tape or 32K Disk, **$29.95;**
ROM Cartridge (16K), **$44.95**
**IBM:** 64K Disk, **$29.95**

## FROGGER

From On-Line; Cornsoft
One of the most popular arcade games ever...now available for your home computer! Just as in the arcade game, you must dodge heavy traffic and jump the moving logs in the stream to get home. Fantastic graphics! Requires joystick.
**Apple:** 48K Disk, **$34.95**
**Atari:** 16K Tape or 32K Disk, **$34.95**
**TRS-80:** 16K Tape, **$19.95;**
32K Disk, **$22.95**

## THRESHOLD

By Warren Schwader & Ken Williams
You, alone, can save the Earth Federation from the lawless aliens who roam our galaxy. Not only have these invaders been attacking our home planet—they're also raiding our space colonies! Space travel has become increasingly dangerous, as has friendly trade. But supplies must go through. As the pilot of the Federation fighter THRESHOLD, it's all up to you! High resolution graphics and sound plus "save the game" feature. Requires joystick.
**Apple:** 48K Disk/**Atari:** 40K Disk, **$39.95**
**VCS: $22.95**

## POOL 400/ POOL 1.5

From IDSI
A remarkable action-simulation...it looks and plays ***just like the real thing!*** You can play several different types of pool at your choice of table speed with "instant replay" of any shot. Hi-res color graphics; requires joystick.
**Apple:** 48K Disk, **$34.95**
**Atari:** ROM Cartridge (16K), **$39.95;**
48K Disk, **$34.95**

## WIZARD OF WOR

From Roklan
Can you defeat the WIZARD OF WOR? First you must descend into the ever-changing maze of Dungeons with your Worriors, and do battle with the monsters you encounter, like the Burwors, Garwors, Worluk and enemy Worriors. Only then can you turn your attention to the Wizard, who can teleport magically around the screen, hurtling lightning bolts as he moves. Simultaneous 1 or 2 player action.
**Atari:** 32K Disk, **$39.95;**
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in the file Labeller, one in the CONST section ($Idir/const.text) containing the directory constants, and one in the TYPE section ($Idir/types.text) containing the directory types. After saving all files on your work disk, return to command level.

Place the SYSTEM.COMPILER disk into #4 (slot 6, drive 1). The file SYSTEM.COMPILER is usually found on the disk called APPLE2:. Select C)OMPILE, respond LABELLER as the text to compile and respond $ (meaning same name) as the code file to save. After successful compilation, replace the boot disk in #4. Align the labels in your printer, execute Labeller, and presto—neat and useful labels with the touch of a finger.

Here is a brief description of the labeller program. Many constants, types and variables are expressed using the underline (e.g., LINES_

*Listing continued.*

```
        begin {a bubblesort}
        write ('Sorting.');
        for I:=2 to CATALOG[0].D_NUM_FILES do
          begin
          write('.');
          for J:=CATALOG[0].D_NUM_FILES downto I do
           if (FILE_NAME[J-1] > FILE_NAME[J]) then
             begin
             FILE_NAME[0]:=FILE_NAME[J-1];
             FILE_NAME[J-1]:=FILE_NAME[J];
             FILE_NAME[J]:=FILE_NAME[0]
             end;
          end
      end {a bubblesort};
    for I:=1 to CATALOG[0].D_NUM_FILES do ADD(FILE_NAME[I]);
    end;
  end   {COMBINENAMES};

{-------------------------------------------------------------------------}
{       Procedure to print formatted labels                               }
{-------------------------------------------------------------------------}
procedure PRINTLABEL;

const

BOLDFACE_ASCII_CODE     = 01;           { Set for IDS 440.  Set           }
NORMAL_ASCII_CODE       = 02;           { to your printer or to 00        }

var

P                       :interactive;
SKIPPED,
LINES_EACH_LABEL,
LINE_NOW,
I,
ADVANCE                 :integer;

begin
SKIPPED:=0;
LINES_EACH_LABEL:=round(LABEL_HEIGHT * LINES_PER_INCH);
reset (P,'PRINTER:');
write(P,chr(BOLDFACE_ASCII_CODE));
write(P,CATALOG[0].D_VID,':');
writeln(P,chr(NORMAL_ASCII_CODE));
LINE_NOW:=2;
while (length(LINE[LINE_NOW-1])>0) do
  begin
  writeln (P,LINE[LINE_NOW-1]);
  LINE_NOW:=LINE_NOW+1;
  if (((LINE_NOW+SKIPPED) mod LINES_EACH_LABEL) = 0) then
    begin
    writeln(P); SKIPPED:=SKIPPED+1
    end;
  end {while};
if (((LINE_NOW+SKIPPED) mod LINES_EACH_LABEL) > 0) then
  begin
  ADVANCE:=LINES_EACH_LABEL - ((LINE_NOW+SKIPPED) mod LINES_EACH_LABEL);
  for I:= 0 to ADVANCE do writeln(P);
  end;
end   {PRINTLABEL};

{-------------------------------------------------------------------------}
{       M A I N    P R O G R A M                                          }
{-------------------------------------------------------------------------}
begin {MAIN program}
DONE_WITH_PROGRAM:=false;
page  (output);
CENTER (1,TITLE);
writeln;
repeat
  writeln;
  writeln; write ('Select volume "4" or "5" to process or <ret> to quit: ');
  repeat I:=DIGIT until (I in [0,4,5]);
  if (I=0) then DONE_WITH_PROGRAM:=true;
  if (DONE_WITH_PROGRAM) then writeln ('QUIT') else writeln (I);
  if not (DONE_WITH_PROGRAM) then
    begin
    unitread (I,CATALOG,sizeof(CATALOG),DIRBLK);
    COMBINENAMES;
{-------------------------------------------------------------------------}
begin {MAIN program}
DONE_WITH_PROGRAM:=false;
page  (output);
CENTER (1,TITLE);
writeln;
repeat
  writeln;
  writeln; write ('Select volume "4" or "5" to process or <ret> to quit: ');
  repeat I:=DIGIT until (I in [0,4,5]);
  if (I=0) then DONE_WITH_PROGRAM:=true;
  if (DONE_WITH_PROGRAM) then writeln ('QUIT') else writeln (I);
  if not (DONE_WITH_PROGRAM) then
    begin
    unitread (I,CATALOG,sizeof(CATALOG),DIRBLK);
    COMBINENAMES;
    PRINTLABEL;
    end;
until (DONE_WITH_PROGRAM);
end   {MAIN program}.

{-------------------------------------------------------------------------}
{                                                                         }
{       Apple Pascal ver 1.1 disk directory constants.                    }
{       Include this file in the const section of your program.           }
{                                                                         }
{-------------------------------------------------------------------------}
```

*Listing continued.*


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*Listing continued.*

```
MAX_DIR          = 77;    {maximum number of entries in directory}
VID_LENG         =  7;    {maximum number characters in volume ID}
TID_LENG         = 15;    {maximum number characters in title  ID}
F_BLK_SIZE       =512;    {standard disk block length in bytes   }
DIR_BLK          =  2;    {directory starts  this disk-block addr}

{------------------------------------------------------------------------}

{------------------------------------------------------------------------}
{                                                                        }
{       This shows the Apple Pascal ver. 1.1 directory layout.           }
{       Declare var ??:directory for manipulating the directory          }
{       as a single unit under program control.  To load the             }
{       contents of a directory use the code                             }
{                                                                        }
{               unitread (UNITNUM,??,sizeof(??),DIRBLK)                  }
{                                                                        }
{       where UNITNUM is 4,5,9..12 depending on the disk drive,          }
{       ?? is a var of type directory,                                   }
{       sizeof(??) controls overlaying the bytes from disk onto the      }
{       correct area of RAM,                                             }
{       and DIRBLK is set to 2 which is the start of the disk            }
{       directory.                                                       }
{                                                                        }
{       This is an include file for the type section of your program.    }
{                                                                        }
{                                                                        }
{------------------------------------------------------------------------}

DATEREC          = packed record
                     MONTH          : 0..12;
                     DAY            : 0..31;
                     YEAR           : 0..100;       {100 IMPLIES TEMP VOLUME}
                     end {DATEREC};

VID              = string[VID_LENG];

DIR_RANGE        = 00..MAX_DIR;

TID              = string[TID_LENG];             {file TITLE ID}

FILEKIND         = (UNTYPEDFILE,XDSKFILE,CODEFILE,TEXTFILE,INFOFILE,DATAFILE,
                    GRAFFILE, FOTOFILE, SECUREDIR);

DIR_ENTRY        = packed record
                     D_FIRST_BLK    :integer;       {1ST PHYSICAL DISK ADDR }
                     D_LAST_BLK     :integer;       {BLK AFTER LAST BLK USED}
                     case D_FKIND: FILEKIND of
                       SECUREDIR, UNTYPEDFILE:
                       {only in dir[0] -- this is volume info}
                        (FILLER1    :0..2048;       {UNUSED STUFF}
                         D_VID      :VID;           {NAME of DISK VOL}
                         D_EOV_BLK  :integer;       {LAST BLOCK in VOL}
                         D_NUM_FILES:DIR_RANGE;     {NUMB FILES in DIR}
                         D_LOAD_TIME:integer;       {TIME of LAST ACCESS}
                         D_LAST_BOOT:DATEREC        {MOST RECENT DATE SETTING}
                        ) {end case securedir, untypedfile};

                       XDSKFILE, CODEFILE, TEXTFILE, INFOFILE,
                       DATAFILE, GRAFFILE, FOTOFILE:
                       {for dir[1..etc] -- regular file info}
                        (FILLER2    :0..1024;       {UNUSED STUFF}
                         STATUS     :boolean;       {for FILER WILDCARDS}
                         D_TID      :TID;           {TITLE of file}
                         D_LAST_BYTE:1..F_BLK_SIZE; {NUMB BYTES in FILES LAST
                                                     BLOCK}
                         D_ACCESS   :DATEREC        {DATE of LAST MODIFICATION}
                        )  {end case xdskfile etc}
                     end {case D_FKIND};

DIRECTORY        = array [DIR_RANGE] of DIR_ENTRY;
```

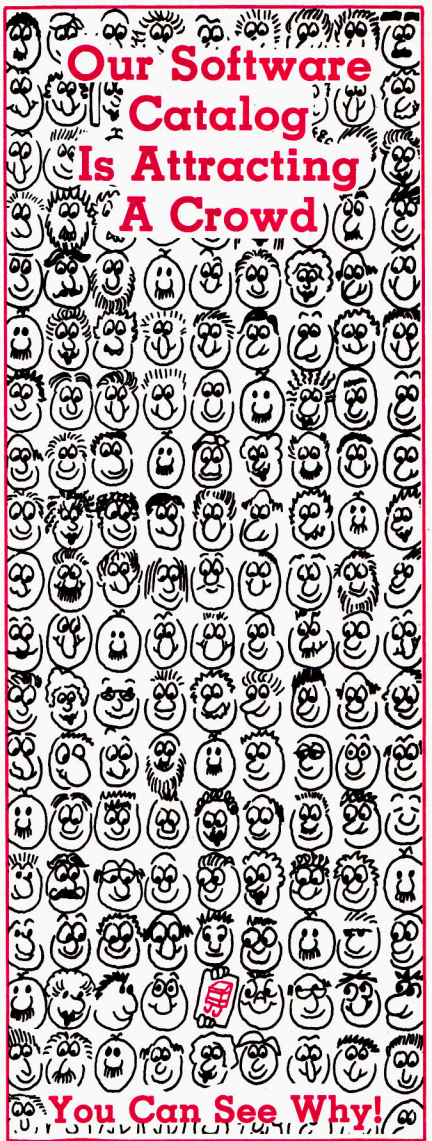
PER_INCH). The compiler ignores the underline character, but, with the preponderance of compound variable names in Pascal, using the underline improves program readability. Only modified Apple keyboards have the underline character available. You can leave it out with no effect on the program. The constants LINES_PER_INCH and CHARS_PER_INCH are integers, and should be expressed according to your printer's specifications. The constants LABEL_WIDTH and LABEL_HEIGHT are real numbers and should be expressed in inches according to the size of your labels.

Procedure Center centers lines of text neatly on the screen, and Function Digit painlessly returns a single-digit input from the user. Procedure Combinenames packs file names into neat lines just the right size for the labels. The upline character (|) is used as a separator, but you may substitute any string you like.

Procedure Printlabel lets you use boldface type if your printer has that feature, triggered by a control character. After each label is printed, the paper is advanced to the start of the next label. If your printer has a bottom-margin skip feature (such as with Integral Data Systems printers) it should be disabled. Finally, the main program is basically a loop allowing the user to insert and remove disks using devices #4 and/or #5, printing a label for each disk.

So, no more excuses for lost files. ■


Circle 82 on Reader Service card.

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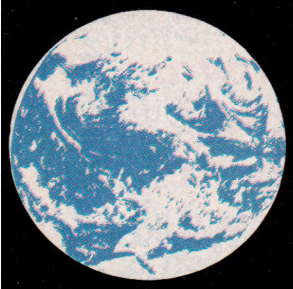

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# Double Duping

**It's become a familiar refrain—"If software vendors would stop overcharging, users would stop making unauthorized copies." This disgruntled businessman fills in the gaps in the argument.**

**by Fred Huntington**

The cockroaches were coming faster and faster. Bugs were overrunning the place. It was terrible—I was becoming more and more bored.

Sound familiar? It's an experience many people suffer these days. You put down $34.95 plus tax to play a game that is mildly interesting for about five minutes.

One of my friends' favorite pastimes is to throw lousy software against the wall. When I talk to Robert, I ask him how he liked so-and-so game. If he didn't like it he screams and shouts and ends up telling me he threw it against the wall.

Well, I've come up against Robert's wall, and feel like throwing software too.

I probably get to look at as much Apple software as anybody, and I can't believe the number of games that cross my computer, costing $29.95 or more, that have little or no sustaining power.

There are great ads to go with these programs, great promises and great artwork on the outside. There may even be great programming and great hi-res graphics. But the bottom line is that, even discounted to $25, many of these games are tedious and simply not worth the price. How long do you want to keep catching creatures trying to commit suicide or cockroaches occupying a hotel?

Many of these games would be better marketed as a part of a combo-pack. For example, On-Line's Laff-Pack gives you four mediocre games for the price of one mediocre game.

One of my favorite games is still Gary Shannon's Breakthru, which used to be available on cassette from Programma for $9.95. I spent hours and hours with that game and I still like it. What's happened to that sort of value? If you compare dollars spent to hours of resulting entertainment, Breakthru would probably be the number one all-time hit, followed closely by Space Invaders.

Other games that are good values include Sneakers, by Sirius, and Choplifter by Broderbund. DataMost has a new game called CrazyMazey that is the best of its kind in many months.

Why don't we have more good game values? Perhaps the people responsible for the garbage sold are the consumers. I was at a party of computer people once and heard the president of a highly respected company say, "To the consumer it doesn't matter if you charge $29.95 or $39.95. They're going to buy it just the same."

Now that statement made me sick—we're being taken! If a company can get $10 more for its product, does it have the right to do it? Sure it does—if the consumer lets the publisher get away with it.

A funny sequel to this story is that the same president told me at another party a year later that the Apple market is dead, that they're only selling half as many Apple programs as they used to.

Believe me, people, the Apple market is alive and doing very well. Sirius plans to come out with some packages under $20 soon. They're also talking about combining several games on one disk. This makes sense to me; did you ever see a utility disk with only one program on it?

Can the software companies afford to sell at a lower price? Let's take a look at the breakdown of cost for a piece of software. Most dealers buy from distributors. On a $30 item, the distributor generally gives the manufacturer $13.50 per program. Approximately 20 percent, or $2.70, of that goes to the author, leaving $10.80. Disk production generally costs about $2.50 for the disk, including having it

*Address correspondence to Fred Huntington, 1945 South Dair Ave., Corcoran, CA 93212.*

copied, and documentation. That leaves $8.30. From that has to come advertising, distribution costs and overhead. (One page in *Byte* magazine, black and white, can cost almost $6000.)

Even if the net profit gets down to $5, that's a good profit for a reasonable investment.

It costs the same (excluding royalties, which are a percentage of the selling price) to produce a $50 program as it does a $10 program. (Some manufacturers claim it costs $7–8 to produce a disk.)

Why not come out with fewer, but better, programs at a lower price? It might even alleviate the piracy problem.

I know people who won't take the time to LockSmith certain programs because they're not worth the time or the disk to copy them—so who will want them at $30? Not I.

Is VisiCalc really worth $250? I think it's a useful program, one that I would be lost without. But, when it first came out it was only $120. Then it jumped to $150, at which time it became extremely successful, and was replaced by a new version costing $200.

Then Personal Software changed their name to VisiCorp, added new packaging and raised the price another $50. I would have been just as happy to have VisiCalc at the old price with the old name and the old binders. The fancy new stuff didn't help me in my business—nor did it help anyone else, so why must we pay another $50?

Then there's the company so desperate to have a good product that they entice their authors with unreasonable royalty payments, so that, in the long run, you and I end up paying more. Okay, they want a good product. But are they really helping the industry by giving outrageous royalties? What, then, is a reasonable price for software? If you could buy games for $10 and $15, chances are you would buy more software.

When L & S software came out with Crossword Magic, there was no doubt that it was a quality product with lots of care taken in making it. Its price of $79.95, however, seemed totally unreasonable to me.

Now, Steve Sherman, the author, is a reasonable guy. So when he was approached at a computer show in San Jose last year, he was talked into lowering the price $30—a pretty gutsy move. I have no doubt that L & S has sold many more Crossword Magics than if they had left the price at $80.

But lower prices are another problem we're facing. A person I respect highly was recently quoted as saying, "There is so much poor educational software available that people would consider my programs as the same poor quality unless I charged more for them."

Although this information comes third hand, it points out a very real problem. Some publishers are afraid that if they charge too little, people won't think the products are any good.

This is where *inCider* and other computer publications come in. If a program is good, the reviews will be good—no matter what the price. If it's bad, the review will be bad.

Now, it may be that I'm underestimating the cost of production and advertising. I know Ken Williams of On-Line once told me that by the time he paid all the production costs, royalties and advertising, he was making $2 on each word processor that listed for $89.95. It is noteworthy, however, that On-Line's word processor has always been among the cheaper ones on the market. It is also a high quality product and has consistently been one of the best-selling word processors on the market, definitely helped along by its reasonable price.

Our free enterprise system works well in this country. It's time for some more software publishers to realize that if they want a jump on the competition, they're going to have to offer a better ratio of price to entertainment value (or functionality).

The publisher that comes out with a good game for under $20 will be an overnight leader in the software business.

My opinions are based on what I hear on the phone every day. Am I listening to the wrong people? Am I all wet? Do you agree with me? I'd like to hear what the consumer and the manufacturer have to say. ■

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# Poking Perfection

**Want to use graphics commands to format a text screen? With the help of this article you may do just that.**

by A. E. Doughty

We cannot use the HLIN, VLIN and PLOT statements on the Apple II text screen because the Apple manuals fail to tell us how! I propose to correct this omission now.

HLIN, VLIN and PLOT statements on a low-resolution graphics screen draw horizontal lines, vertical lines and plot points on the screen. These commands can also perform text screen operations that normally require more complicated Basic or machine-language programming. This article assumes the reader already knows how to use these commands on the low-resolution graphics screen.

The GR statement converts the Apple II to the graphics screen where each text character is divided into two half characters (see Figure 1). Memory location 48 contains the value that controls these two half characters (see Figure 2).

If the statement COLOR = 2 is issued, then byte (memory location) 48 changes to contain the value 34. Experiment with this in direct mode by issuing various COLOR = n statements and peek the byte 48 to see what value it contains.

### The VLIN Statement

Byte 48 can be poked with any value between 0 and 255 and will produce some interesting color effects on the graphics screen, but on the text screen even more interesting things happen. Try the short program in Listing 1.

Table 1 shows all the text characters and mode (Reverse, Flash and Normal) the VLIN statement will display on the Apple II text screen.

### The HLIN Statement

Now add line 160 to Listing 1 to read:

```
100 HOME
110 FOR K = 0 TO 255
120 VTAB 10: HTAB 5
130 PRINT "VALUE POKED INTO BYTE 48 = ";K;" = "
140 POKE 48,K
150 VLIN 0,47 AT 36
200 GET A$
210 NEXT K
```

*Listing 1. This short Basic program produces intriguing effects on the text screen.*

```
160 HLIN 0,39 AT 22
```

When you run this program, you expect to see the characters in the vertical line repeated in the horizontal line. Alas, Apple never made things that easy!

Back to byte 48. The most significant four bits of the byte control the bottom half of the character and the least significant four bits control the top half of the character (see Figure 2). If the screen is divided into 48 half

```
100 HOME
110 FOR K = 0 TO 255
120 POKE 48,K
130 FOR J = 0 TO 39 STEP 2
140 PLOT J,J
150 PLOT J,J + 1
160 NEXT J
170 FOR J = 39 TO 0 STEP  - 2
180 PLOT 39 - J,J
190 PLOT 39 - J,J + 1
200 NEXT J
300 GET A$
310 NEXT K
```

*Listing 2. Try this Basic program to produce text characters from Table 1.*

*Address correspondence to A. E. Doughty, 11715 145 Ave., Edmonton, Alberta, T5X 1M2 Canada.* *Mr. Doughty retains the copyright for this article.*

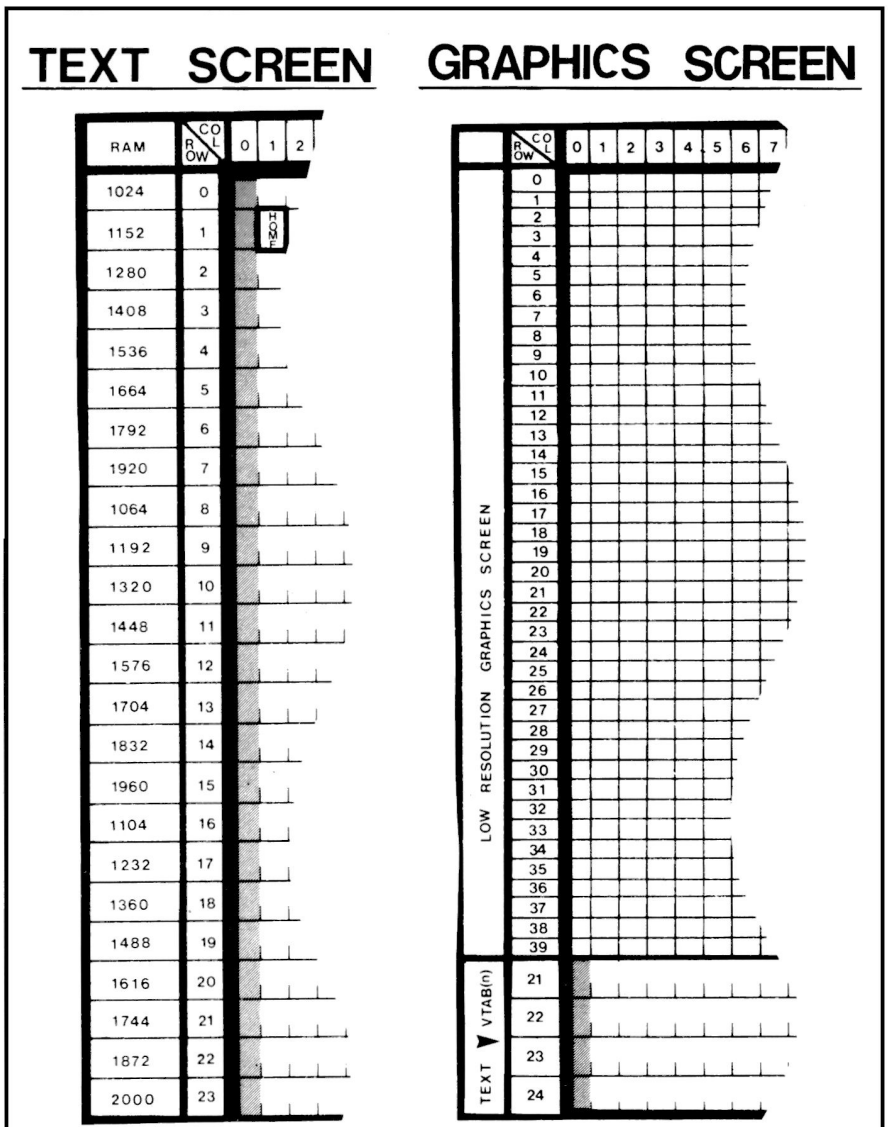


*Figure 1. Showing that when the text screen is converted to graphics mode, each text character is divided horizontally into two graphics lines.*

rows numbered 0 to 47, then the least significant four bits of byte 48 control the *even* numbered half rows 0, 2, 4, 6. . . 46, and the most significant four bits of byte 48 control the *odd* numbered rows 1, 3, 5, 7. . . 47.

To demonstrate this, add another line to Listing 1, to read:

```
170 HLIN 0,39 AT 25
```

When you run this program, notice that line 160 outputs to an *even* numbered half row (22), and draws the sequence of characters:

space, !, ", #, $, %, &, (, ), *, +, ', -, ., /

that change every time byte 48 is changed, but the line 170 outputs to an *odd* numbered half row (25), and draws the sequence:

@, P, space, 0

in Inverse, Flash and Normal, but changes once every time the value poked into memory location 48 is a multiple of 16.

Finally add two more lines to this program:

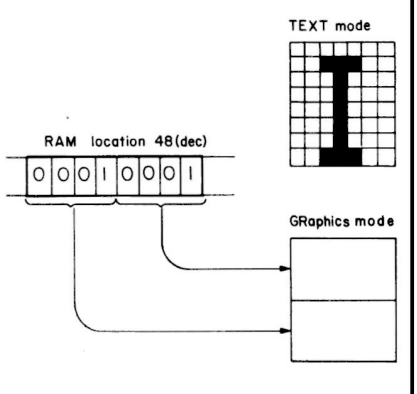


*Figure 2. Illustrates how a text character is controlled by RAM location 48, on the graphics screen.*

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AMPERGRAPH

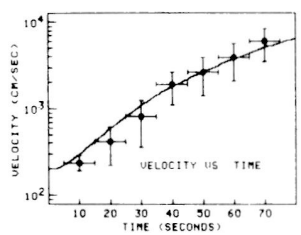
AMPERGRAPH is a powerful, easy-to-use graphics utility for the Apple II Plus. AMPERGRAPH adds twenty-two Applesoft commands that allow effortless generation of professional-looking plots of scientific or financial data. All of the necessary scaling and screen formatting is accomplished with just a few, simple Applesoft lines.

Unlike most other plotting systems for the Apple II which are stand-alone systems, the AMPERGRAPH utility provides extended BASIC graphics language macros that you can use directly in your own Applesoft programs. The additional commands are &SCALE, &LIMIT, &AXES, &GRID, &FRAME, &LOG X, &LOG Y, &LABEL AXES, &LABEL, &VLABEL, &CENTER LABEL, &CENTER VLABEL, &DRAW, &PENUP, &CROSS, &OPEN SQUARE, &CLOSED SQUARE, &OPEN CIRCLE, &CLOSED CIRCLE, &ERROR BARS, &DUMP (to dump the graph on a Silentype printer) and &*DUMP (to link with AMPERDUMP, see below).

AMPERGRAPH uses the Applesoft ampersand machine language jump vector to link to a relocatable 9K routine which normally resides above the second page of high-resolution graphics in the Apple II Plus.

SAMPLE AMPERGRAPH PROGRAM LISTING:

```
10 &SCALE, 0, 80, 80, 13000
15 LX$ = "TIME (SECONDS)":LY$ = "VELOCITY
   (CM/SEC)"
20 &LOG Y:&LABEL AXES, 10, 10
25 LABEL$ = "VELOCITY VS. TIME":&LABEL, 30,
   200
30 FOR T = 0 TO 80:&DRAW, T, 150 + T12:NEXT T
35 FOR T = 10 TO 70 STEP 10
40 &CLOSED SQUARE, T,
   (150 + T12)*(.8 + .4*RND(3))
45 &ERROR BARS, 5, T12/2
50 NEXT T:&DUMP
```




AMPERDUMP

AMPERDUMP is a high-resolution graphics dump utility which was written specifically to take advantage of the graphics features of the Epson MX-80 and MX-100 printers (MX-80 must have the Graftrax conversion). AMPERDUMP offers many features which are not available in other graphics dump routines:

- Three horizontal magnifications (2.33, 4.66 and 6.99 inches wide)
- Nine vertical magnifications with the MX-80 (0.88, 1.77, 2.64, 3.78, 4.25, 4.45, 5.31, 5.87, and 7.96 inches high); and three vertical magnifications with the MX-100 (2.64, 5.31, and 7.96 inches high)
- Horizontal and vertical magnifications can be specified independently to produce 27 different plot size formats with the MX-80, and 9 different formats with the MX-100
- Normal / Inverse dumps
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- Adjustable horizontal tab
- Easy to use
- Compatible with AMPERGRAPH
- Relocatable

The AMPERGRAPH and AMPERDUMP graphics utilities require and Apple II Plus (or Apple II with language card) with 48K and DOS 3.3. The AMPERDUMP utility requires and Epson MX-80 with Graftrax, or an MX-100, and one of the following interface cards: Epson, Apple, Grappler, Interactive Structures, or Mountain Computer.

AMPERGRAPH and AMPERDUMP are available from your dealer for $30.00 each, or order direct. Include $1.50 for shipping and handling; Wisconsin residents add 4% sales tax.

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| Value To Be Poked into Video RAM for: | | | | | | | |
|---|---|---|---|---|---|---|---|
| Text Character | Reverse | Flashing | Normal | Text Character | Reverse | Flashing | Normal |
| @ | 0 | 64 | 128 | space | 32 | 96 | 160 |
| A | 1 | 65 | 129 | ! | 33 | 97 | 161 |
| B | 2 | 66 | 130 | " | 34 | 98 | 162 |
| C | 3 | 67 | 131 | # | 35 | 99 | 163 |
| D | 4 | 68 | 132 | $ | 36 | 100 | 164 |
| E | 5 | 69 | 133 | % | 37 | 101 | 165 |
| F | 6 | 70 | 134 | & | 38 | 102 | 166 |
| G | 7 | 71 | 135 | ' | 39 | 103 | 167 |
| H | 8 | 72 | 136 | ( | 40 | 104 | 168 |
| I | 9 | 73 | 137 | ) | 41 | 105 | 169 |
| J | 10 | 74 | 138 | * | 42 | 106 | 170 |
| K | 11 | 75 | 139 | + | 43 | 107 | 171 |
| L | 12 | 76 | 140 | , | 44 | 108 | 172 |
| M | 13 | 77 | 141 | - | 45 | 109 | 173 |
| N | 14 | 78 | 142 | . | 46 | 110 | 174 |
| O | 15 | 79 | 143 | / | 47 | 111 | 175 |
| P | 16 | 80 | 144 | 0 | 48 | 112 | 176 |
| Q | 17 | 81 | 145 | 1 | 49 | 113 | 177 |
| R | 18 | 82 | 146 | 2 | 50 | 114 | 178 |
| S | 19 | 83 | 147 | 3 | 51 | 115 | 179 |
| T | 20 | 84 | 148 | 4 | 52 | 116 | 180 |
| U | 21 | 85 | 149 | 5 | 53 | 117 | 181 |
| V | 22 | 86 | 150 | 6 | 54 | 118 | 182 |
| W | 23 | 87 | 151 | 7 | 55 | 119 | 183 |
| X | 24 | 88 | 152 | 8 | 56 | 120 | 184 |
| Y | 25 | 89 | 153 | 9 | 57 | 121 | 185 |
| Z | 26 | 90 | 154 | : | 58 | 122 | 186 |
| [ | 27 | 91 | 155 | ; | 59 | 123 | 187 |
| \ | 28 | 92 | 156 | < | 60 | 124 | 188 |
| ] | 29 | 93 | 157 | = | 61 | 125 | 189 |
| ^ | 30 | 94 | 158 | > | 62 | 126 | 190 |
| — | 31 | 95 | 159 | ? | 63 | 127 | 191 |

*Table 1. Values to be poked into RAM address 48 to display alphanumeric characters on the text screen.*

```
100 FOR K = 0 TO 255
110 POKE 48,K
120 HLIN 39,0 AT 0
130 HLIN 39,0 AT 1
140 VLIN 0,47 AT 0
150 HLIN 0,39 AT 46
160 HLIN 0,39 AT 47
170 VLIN 47,0 AT 39
180 GET A$
190 NEXT K
```

*Listing 3. A routine to border your screen.*

| Routine | Entry Point | Accumulator | Y Register | Other RAM to Set |
|---|---|---|---|---|
| VLIN | $F828 | high row | column | low row in byte 45 |
| HLIN | $F819 | row number | left column | right column in byte 44 |
| PLOT | $F800 | row number | column | — |

*Table 2. Entry points to ROM sequences, and RAM addresses that have to be preset before accessing the ROM programs.*

```
180 HLIN 0,39 AT 30
190 HLIN 0,39 AT 31
```

Voila! A single HLIN displays the same characters as the VLIN statement.

Notice in lines 180 and 190 we drew the HLIN in the *even* numbered half row (30) and in the *odd* numbered half row (31) immediately following. To determine the rows consider the Apple II text screen as 24 rows numbered 0 to 23 (refer to Figure 1), then the even numbered half row is determined by multiplying the row (0 to

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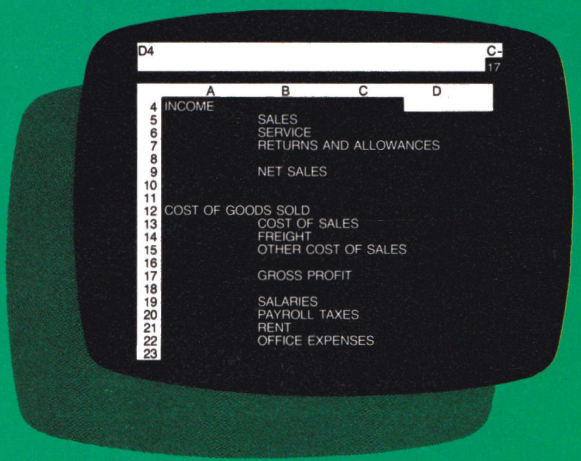


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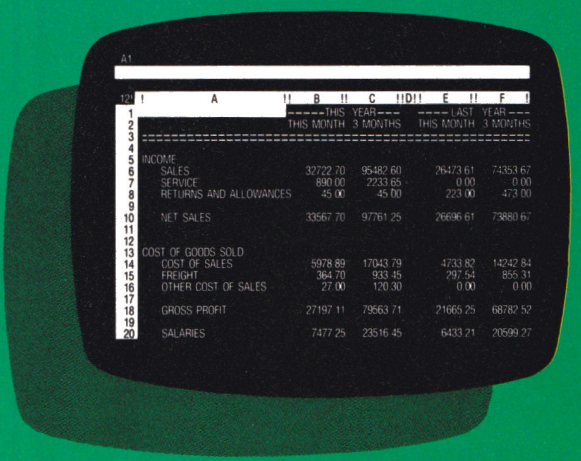


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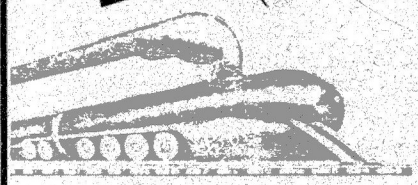

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*Listing 4.*
*Assembly-language routine using HLIN and VLIN to draw a border around the text screen.*

```
PRESS ANY KEY TO CONTINUE

SOURCE FILE: H/V B
------ NEXT OBJECT FILE NAME IS H/V B.OBJ0
6000:              1        ORG  $6000     ;ORIGIN
6000:20 58 FC      2        JSR  $FC58     ;HOMER
6003:20 35 FD      3 CHAR   JSR  $FD35     ;GET CHAR
6006:85 30         4        STA  $30       ;STORE 48
6008:A9 2F         5        LDA  #47       ;STOP ROW
600A:85 2D         6        STA  $2D       ;STORE 45
600C:A0 00         7        LDY  #0        ;COLUMN
600E:A9 00         8        LDA  #0        ;START ROW
6010:20 28 F8      9        JSR  $F828     ;VLIN
6013:A0 27        10        LDY  #39       ;COLUMN
6015:A9 00        11        LDA  #0        ;START ROW
6017:20 28 F8     12        JSR  $F828     ;VLIN
601A:A9 27        13        LDA  #39       ;STOP COLUMN
601C:85 2C        14        STA  $2C       ;STORE 44
601E:A0 00        15        LDY  #0        ;START COL
6020:A9 00        16        LDA  #0        ;ROW EVEN #
6022:20 19 F8     17        JSR  $F819     ;HLIN
6025:A0 00        18        LDY  #0        ;START COLUMN
6027:A9 01        19        LDA  #1        ;ROW ODD (EVEN #+1)
6029:20 19 F8     20        JSR  $F819     ;HLIN
602C:A0 00        21        LDY  #0        ;START COLUMN
602E:A9 2E        22        LDA  #46       ;ROW EVEN #
6030:20 19 F8     23        JSR  $F819     ;HLIN
6033:A0 00        24        LDY  #0        ;START COLUMN
6035:A9 2F        25        LDA  #47       ;ROW ODD (EVEN #+1)
6037:20 19 F8     26        JSR  $F819     ;HLIN
603A:4C 03 60     27        JMP  CHAR      ;DO ANOTHER CHARACTER

*** SUCCESSFUL ASSEMBLY: NO ERRORS
```

23) by 2; and you obtain the odd row by adding 1 to this value.

### The Plot Statement

The plot statement behaves in exactly the same way as the HLIN statement. Plotting to an *even* numbered half row produces the characters: space ! " # $ . . . and so on, while plotting to an *odd* numbered half row produces the characters: @, P, space and 0, in the Inverse, Flash and Normal modes respectively.

By plotting to both the even numbered half row, and to the corresponding odd numbered half row, the characters in Table 1 can be reproduced.

Try the program in Listing 2.

### Poking to the Screen

You can also poke the values shown in Table 1 into the video RAM to obtain the characters indicated. Demonstrate this by adding the following lines to Listing 2.

```
200 POKE 1299,K
210 POKE 1300,K
```

Figure 1 shows the RAM locations to be poked for the first column of each text screen line. For adjacent columns on the same line, add the column number (0 to 39) to the values indicated in Figure 1.

VLIN, HLIN and PLOT introduce some interesting potential. Besides making the text screen command set more versatile, calling machine-language routines to perform some text screen functions shows a speed advantage over some of the Basic language routines that would perform the same function. The routine in Listing 3 draws a border around the screen in all 255 different values that can be poked to memory location 48.

Notice the considerable speed advantage this program offers, compared to a Basic program that performs the same task.

### Using the Routines in Assembly

Machine-language programmers can also use the HLIN, VLIN and PLOT routines from assembly language. Load the appropriate memory locations with the variables that control the start, stop and row or column locations, then JMP to the appropriate entry points.

Table 2 shows the locations to use, and the accompanying assembly routine (Listing 4) illustrates the programming technique.

In both assembly and Basic you must draw the HLIN in both the even numbered half row and the odd numbered half row to replicate the same characters produced by drawing the VLIN. ■


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# From Screen to Printer

**Got a hi-res screen you wish to have printed? An Epson MX-80 with Graftrax 80 installed could make use of this handy utility program to dump your graphics to your printer.**

**by Bill Basham**

*Program listing. Epson hi-res graphics screen dump.*

```
BASL    .EQU 0 ;Base address of Hi-Res graphics line
BASH    .EQU 1
MASK    .EQU 2 ;selects desired bit from screen byte
CHAR    .EQU 3 ;byte sent to printer
VLINE   .EQU 4 ;screen line counter
VLAST   .EQU 5 ;last screen line for one print line
LASTLN  .EQU 6 ;flag for last print line
        .PROC EPSOND

START   LDA #0
        STA VLINE       ;start at screen line 0
        STA LASTLN      ;initialize last print line flag

PLINE   LDY #8          ;set line spacing to 7/72 inch
$10     LDA EPSON-1,Y   ;and send CR and LF
        JSR POUT
        DEY
        BNE $10
        LDA VLINE       ;calculate VLAST=VLINE+7
        CLC
        ADC #7          ;prints 7 screen lines for each print line
        CMP #192.       ;check for last print line
        BCC NOTDN
        LDA #192.
        STA LASTLN      ;set flag for last print line
NOTDN   STA VLAST       ;set last screen line for this print line
MSK1    LDA #1          ;initialize MASK for bit 0
        STA MASK
NXTMSK  LDA #0
        STA CHAR        ;initialize output char to blank
        LDX VLINE       ;X register holds current screen line
SLINE   JSR BCALC       ;calculate base address of screen line
        CLC             ;start with carry clear
        LDA @BASL,Y
        AND MASK
        BEQ NOSET
        SEC             ;set carry if screen bit is on
NOSET   ROL CHAR        ;rotate carry into output char
        INX             ;next screen line
        CPX VLAST       ;last screen line for this print line?
        BCC SLINE       ;no - do next screen line
        LDA CHAR        ;yes - print output char
        BIT LASTLN      ;check for last print line
        BPL NOTLST
        ASL A           ;last print line has only 3 screen lines
        ASL A           ;must shift CHAR 4 bits
```

*Listing continued.*

The program in the listing will print out the Apple II hi-res graphics screen on an Epson MX-80 printer with the Graftrax 80 graphics option installed. The printer must be connected with a parallel interface card in slot #1.

The source listing is written for the Apple Pascal Assembler. If you want to use the routine from Pascal, enter the source listing using the Pascal Editor and assemble it. To call the routine from within a Pascal program, you should include the following statement in your program: PROCEDURE EPSOND;EXTERNAL;. Then link the EPSOND routine with your Pascal program as described on page 149 of the Pascal reference manual. Whenever you call EPSOND, the current hi-res graphics screen will be printed.

I have assembled the program at location $300 for use with Basic programs. Enter the program from the memory dump using the Apple monitor and save it with BSAVE EPSOND,A$300,L$B9. You can now print the hi-res screen with BRUN EPSOND or BLOAD EPSOND followed by a CALL 768 from within a Basic program.

*Address correspondence to Bill Basham, Diversified Software Research Inc., 5848 Crampton Court, Rockford, IL 61111.*

*Listing continued.*

```
        ASL A
        ASL A
NOTLST  JSR POUT        ;send CHAR to printer
        ASL MASK        ;shift mask for next screen bit
        BPL NXTMSK      ;check for 8th screen bit selected
        INY             ;this means go to next screen byte on line
        CPY #28         ;check for last byte on line
        BCC MSK1        ;no - do next byte on line
        LDA VLAST       ;yes -set VLINE to VLAST
        STA VLINE
        LDA LASTLN      ;check for last line just printed
        BEQ PLINE       ;no - print next line
PRTS    LDA #1B         ;restore default line spacing
        JSR POUT
        LDA #32
        JSR POUT
        LDA #0D         ;send CR
        JSR POUT
        LDA #0A         ;send LF

POUT    BIT 0C1C1       ;Slot #1 printer output routine
        BMI POUT        ;wait for printer ready
        STA 0C090       ;send byte
        RTS

;BCALC - Routine to calculate address of start of screen line
;  call with X register = hi-res screen vertical line # (0 to 191.)
;  Y register is preserved
;  Base address of line is stored in BASL and BASH

BCALC   TXA
        AND #0C0
        BEQ $20
        BMI $10
        LDA #28
        BNE $20
$10     LDA #50
$20     STA BASL
        TXA
        AND #8
        BEQ $30
        LDA BASL
        ORA #80
        STA BASL
$30     TXA
        AND #7
        STY BASH ;save Y reg.
        TAY
        LDA BTBL,Y
        LDY BASH ;restore Y reg.
        STA BASH
        TXA
        AND #30
        BEQ $40
        LSR A
        LSR A
        LSR A
        LSR A
        ADC BASH
        STA BASH
$40     RTS  ;DONE
BTBL    .BYTE 20,24,28,2C,30,34,38,3C ;small table of line addresses

EPSON   .BYTE 1,24.,4B,1B,0A,0D,31,1B ;bytes to send to printer
                ;sets line spacing, sends CR,LF, and sets bit graphics
        .END
```

```
300.3B8

0300- A9 00 85 04 85 06 A0 08
0308- B9 B0 03 20 6B 03 88 D0
0310- F7 A5 04 18 69 07 C9 C0
0318- 90 04 A9 C0 85 06 85 05
0320- A9 01 85 02 A9 00 85 03
0328- A6 04 20 74 03 18 B1 00
0330- 25 02 F0 01 38 26 03 E8
0338- E4 05 90 EE A5 03 24 06
0340- 10 04 0A 0A 0A 0A 20 6B
0348- 03 06 02 10 D7 C8 C0 28
0350- 90 CE A5 05 85 04 A5 06
0358- F0 AC A9 1B 20 6B 03 A9
0360- 32 20 6B 03 A9 0D 20 6B
0368- 03 A9 0A 2C C1 C1 30 FB
0370- BD 90 C0 60 8A 29 C0 F0
0378- 08 30 04 A9 28 D0 02 A9
0380- 50 85 00 8A 29 08 F0 06
0388- A5 00 09 80 85 00 8A 29
0390- 07 84 01 AB B9 A9 03 A4
0398- 01 85 01 8A 29 30 F0 08
03A0- 4A 4A 4A 4A 65 01 85 01
03A8- 60 20 24 28 2C 30 34 38
03B0- 3C 01 1B 4B 1B 0A 0D 31
03B8- 1B
*
```

*Source listing.*

The program is written to take a minimum amount of memory. The program first sets the line spacing to 7/72 inch and sends a carriage return and line feed to start a new line. Bit image graphics mode is initialized for 280 bytes. In this mode, each bit of a character sent to the printer controls one of the print wires on the print head. Thus, seven hi-res screen lines are printed for each print line by sending 7-bit characters to the printer. The proper screen bits are selected and packed into CHAR, which is sent to the printer.

The BCALC routine is called repeatedly to find the address of the start of each hi-res screen line. This routine uses a combination of table look-up and calculation to give the fastest possible result in a minimum of space. A faster method is to store all these addresses in a table, but this takes 384 bytes. While this is necessary for high-speed animation programs, it is not needed here since the printer is much slower than the calculation routine.

After the screen is printed, the line spacing is set back to normal, but the top of form count will not be correct. A form feed will not go to the correct position at the top of a page after using the Graphics Dump Routine. To reset the top of form position, turn the printer off and crank the paper by hand to the top of a page. When you turn the printer back on, the top of form will be properly set. ■


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# The Apple Bytes Back

**Keyboard strobing is the name of the game. Here's a fancy little reaction-time exercise for flexing your fingers and your Basic programming technique.**

**by Tam Hutchinson, Jr., and Christopher Osborne**

The inventors of interpreted Basic have done an outstanding job in combining the facility of a high-level language with the flexibility of an assembler. Except for being a little slow in handling large files, on-line communications, graphics and music, Basic is a beautiful programming tool. Basic programs can, of course, use routines outside a program to compensate for any deficiencies. On the other hand, several tricks are available in Basic to overcome most obstacles without having to resort to outside help.

One such obstacle occurs in the case of, say, a game or a print routine where we want to allow the operator to press a character on the keyboard *while the routine continues.* If you use a statement like 1000 INPUT A$ to get the character, not only does program execution halt, but the entry must be followed by the return key—the program will wait until the return key is depressed. The statement 1000 GET A$ is twice as good as 1000 INPUT A$ because the GET verb does not require the return key, but it also halts program execution.

One outstanding alternative is the keyboard strobe. The keyboard strobe routine loads a character from the keyboard into memory position −16384 (the same as 49152), and that character stays there until the keyboard strobe is reset by a statement like 1010 POKE −16368,0. You can tell whether or not a keyboard key has been depressed by checking to see if PEEK (−16384) is greater than 127. If it is, you have a character, and can retrieve the character with the following statement:

```
1000 A$ = CHR$(PEEK( - 16384) - 128)
```

The statements in Listing 1 test for the presence of a character entered at the keyboard, load A$, reset the strobe, and test A$ for being equal to @. Otherwise, program execution ignores the routine.

Now, let's look at the input strobe's application and use it in an unusual little game. The game tests the operator's reaction time in pressing any key after a series of X's is displayed on the screen. Listing 2 is an English version of the program logic.

```
INT (RND (1)(*CPL - 5) + .5) + 1
= INT (  .001   *  (40 - 5)  + .5) + 1
= INT (  .001   *    (35)    + .5) + 1
= INT (          .035        + .5) + 1
= INT (            .535            ) + 1
=                    0               + 1
=                                      1
```

*Example 1. How the interpreter arrives at a value of 1 when RND(1) = .001.*

```
= INT ((COUNT / SEC)*1000 + .5)/1000
= INT ((25    /  78.689)*1000 + .5)/1000
= INT (        .317706414*1000 + .5)/1000
= INT (          318.206414          )/1000
=                  318                 /1000
=                  .318
```

*Example 2. Rounding seconds to the nearest .001.*

```
 980  FOR I = 1 to 10000
1000  IF PEEK ( - 16384)<128 THEN 1040
1010  A$ = CHR$(PEEK( - 16384) - 128)
1020  POKE  - 16368,0
1030  IF A$ = "@" THEN I = 10000:PRINT "ABORTED"
1040  NEXT I
1050  RETURN
```

*Listing 1. A routine that allows early termination if the operator types @.*

*Address correspondence to Tam Hutchinson, Jr., and Christopher Osborne, Locus Systems, PO Box 248, North Wilkesboro, NC 28659.*

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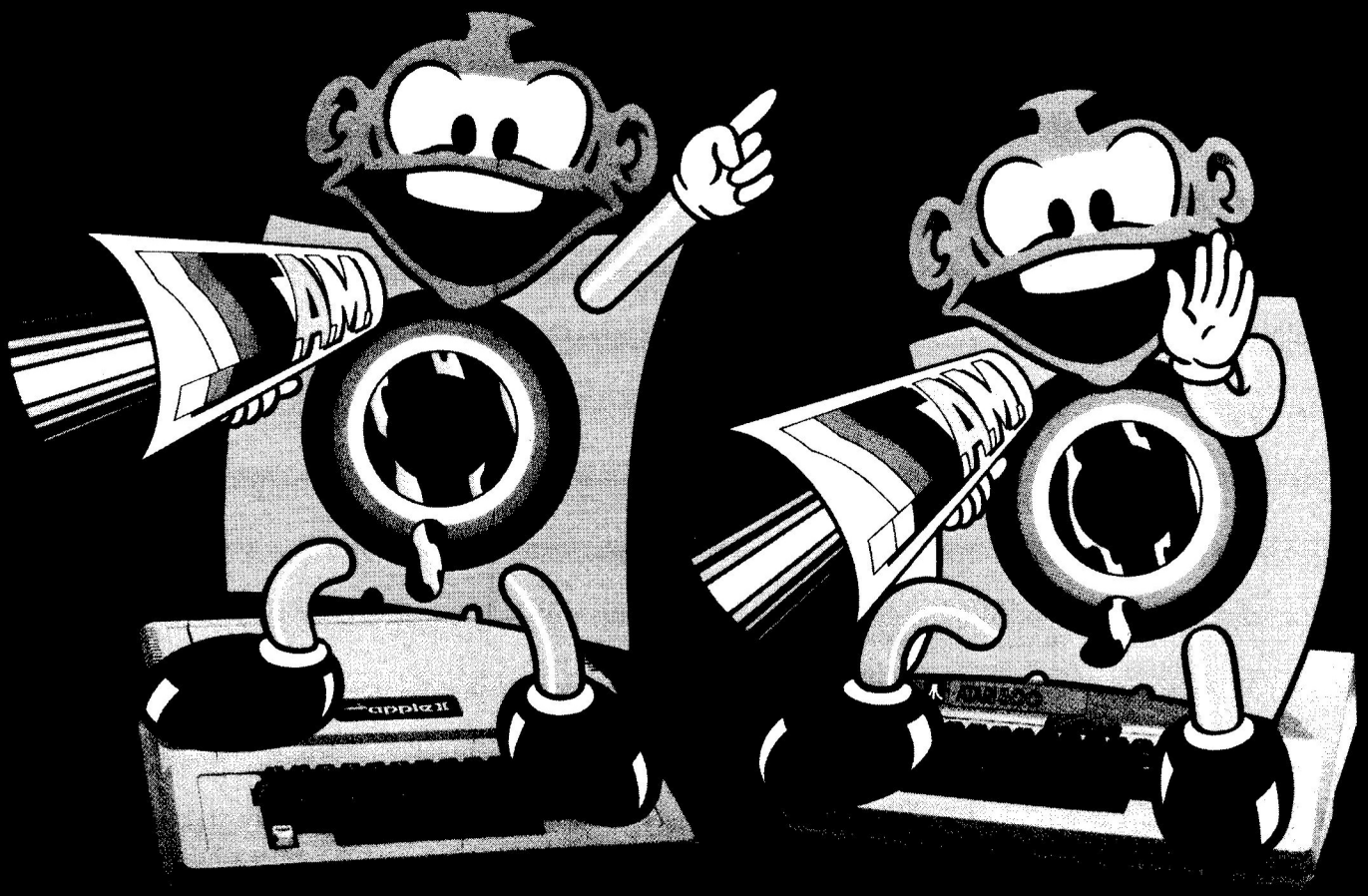


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*Listing 2.*
*An English version of the reaction time program with reference line numbers.*

I. Initialize (lines 20,1000–1200).
II. Repeat the following until the operator types E to exit (lines 30, 2000–2070).
  A. Repeat the following until the operator does not "jump the gun" (lines 2020–2030).
    1. Display the instructions (lines 2100–2210).
    2. Display a "random" number of X's (lines 2220–2280).
    3. If the operator hits a key (line 2260)
      then
      a. Display a message (lines 2300–2360).
      b. Make a noise (lines 2370–2390).
  B. Repeat the following until the operator hits a key (lines 2500–2530):
    Add 1 to a counter (line 2520).
  C. Compute the reaction time in seconds, as the count, divided by counts-per-second (line 2540).
  D. Print the reaction time (lines 2600–2640).
  E. If the reaction time is faster than a previous trial (line 2650)
    then
      Display congratulations (lines 2700–2740).
  F. If the reaction time is slower than a previous trial (line 2660)
    then
      Display the previous low (lines 2800–2840).
  G. Repeat the following until the operator types E to exit or T to try again (line 2060):
      Accept a character from the keyboard (lines 2900–2940).
III. Terminate the program (lines 40 and 3000).

Several program lines need some comment: All the variables, except I and J (loop counters), are initialized and defined in the initialization routine (lines 1000–1200). CPL (characters per line) (line 1050) could be changed for an 80-column screen, but the game would then be a little harder (see line 2110). CSEC (counts per second) (line 1060) may change if this program is run on other machines or other operating systems. CTD (CHAR$'s to display) (line 1070) is initialized to 1 because the For. . . Next loop in which it is used (lines 2220–2270) will always cycle at least once.

Line 2020 checks for a discrepancy (operator pressed a key before all X's were displayed). The discrepancy flag is set in line 2400, and is reset in line 2120.

Line 2110 determines how many X's to display. Subtract 5 from CPL to

*Listing 3. Reaction Time program.*

```
10 REM R E A C T I O N  T I M E  P R O G R A M
20 GOSUB 1000: REM INITIALIZE
30 GOSUB 2000: IF A$ < > EXIT$ THEN 30: REM DO REACTION TIME TEST UNTIL A$ = EXIT$
```

*Listing continued.*

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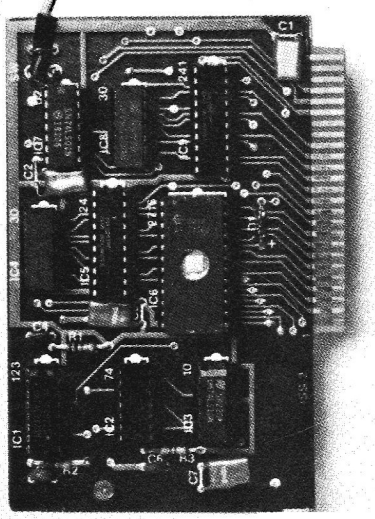

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*Listing continued.*

```
40 GOTO 3000: REM END
50 REM
1000 REM I N I T I A L I Z E
1020 A$ = "": REM          INPUT CHARACTER
1030 CHAR$ = "X": REM      CHARACTER TO DISPLAY IN REACION TEST
1040 COUNT = 0: REM        COUNT OF TIMES THROUGH ROUTINE TO WAIT ON A RESPONSE FROM THE OPERATOR
1050 CPL = 40: REM         MAXIMUM NUMBER OF CHARACTERS PER LINE
1060 CSEC = 78.689: REM    NUMBER OF COUNTS PER SECOND--TO COMPUTE REACTION TIME
1070 CTD = 1: REM          NUMBER OF CHAR$'S TO DISPLAY
1080 DISCREPANCY$ = "N": REM DISCREPANCY IN RESPONSE FROM THE OPERATOR
1090 EXIT$ = "E": REM      CHARACTER DESIGNATING EXIT FROM PROGRAM
1100 HESIT = 10: REM       NUMBER OF COUNTS TO HESITATE BETWEEN CHAR$'S
1110 HIGH = 9999: REM      SOME HIGH NUMBER TO INITIALIZE A LOW REACTION TIME
1120 INPT = -16384: REM    MEMORY POSITION HOLDING A POSSIBLE INPUT CHARACTER
1130 LOW = HIGH: REM       LOWEST REACTION TIME SO FAR
1140 NOGOODCHAR = 127: REM HIGHEST NO-GOOD INPUT CHARACTER VALUE; HIGHER VALUES ARE GOOD
1150 PAUSE = 2000: REM     PAUSE COUNT FOR OPERATOR TO READ INSTRUCTIONS
1160 RASP = -16336: REM    MEMORY POSITION GENERATING A SLIGHT NOISE
1170 SEC = 0: REM          NUMBER OF SECONDS USED TO REACT BY OPERATOR
1180 STROBE = -16368: REM  MEMORY POSITION RESETTING THE INPUT STROBE
1190 TRYAGAIN$ = "T": REM  CHARACTER DESIGNATING TRY AGAIN
1200 RETURN
1210 REM
2000 REM T E S T  R E A C T I O N  T I M E
2020 GOSUB 2100: IF DISCREPANCY$ = "Y" THEN 2020: REM DISPLAY PROBLEM UNTIL NO CHEATING
2030 PRINT "START"
2040 GOSUB 2500: REM GET A REACTION TIME
2050 GOSUB 2600: REM DISPLAY RESULTS OF TEST
2060 GOSUB 2900: IF A$ < > EXIT$ AND A$ < > TRYAGAIN$ THEN 2060: REM TRY UNTIL GET NEXT STEP
2070 RETURN
2080 REM
2100 REM D I S P L A Y  R E A C T I O N  P R O B L E M
2110 CTD = INT (RND (1) * (CPL - 5) + .5) + 1: REM SET LENGTH OF REACTION STRING
2120 DISCREPANCY$ = "N"
2130 HOME
2140 PRINT TAB (CPL / 2 - 10); "REACTION TIME PROGRAM"
2150 PRINT
2160 PRINT "PRESS ANY KEY AFTER THE MOTION STOPS"
2170 PRINT "   . . . BUT NOT BEFORE"
2180 PRINT
2190 FOR I = 1 TO PAUSE: REM GIVE OPERATOR TIME TO READ
2200 :   NEXT I
2210 POKE STROBE, 0: REM CLEAR OUT EXTRANEOUS INPUTS
2220 FOR I = 1 TO CTD: REM DISPLAY THE CHARACTER CTD TIMES
2230 :   FOR J = 1 TO HESIT: REM HESITATE BETWEEN CHARACTERS
2240 :      NEXT J
2250 :   PRINT CHAR$;
2260 :   IF PEEK (INPT) > NOGOODCHAR THEN GOSUB 2300: REM RESET STROBE AND DISPLAY MISTAKE
2270 :   NEXT I
2280 RETURN
2290 REM
2300 REM R E S E T  S T R O B E  A N D  D I S P L A Y  E R R O R
2310 POKE STROBE, 0: REM RESET STROBE
2320 I = CTD: REM SET FOR/NEXT COUNTER TO STOP
2330 PRINT
2340 PRINT
2350 PRINT "**** YOU JUMPED THE GUN"
2360 PRINT "   . . . TRY AGAIN ****"
2370 FOR J = 1 TO HESIT * 10
2380 :   A = PEEK (RASP): REM MAKE A RASPY NOISE
2390 :   NEXT J
2400 DISCREPANCY$ = "Y"
2410 RETURN
2420 REM
2500 REM G E T  A  R E A C T I O N  T I M E
2510 COUNT = 0
2520 COUNT = COUNT + 1: IF PEEK (INPT) < = NOGOODCHAR THEN 2520: REM SUM UNTIL KEYBOARD ENTRY
2530 PRINT
2540 SEC = INT ((COUNT / CSEC) * 1000 + .5) / 1000: REM COMPUTE ELAPSED SECONDS TO NEAREST .001
2550 POKE STROBE, 0: REM RESET INPUT STROBE
2560 RETURN
2570 REM
2600 REM P R I N T  T H E  R E S U L T S
2610 PRINT
2620 PRINT "YOUR TIME WAS "; SEC; " SECONDS"
2630 PRINT
2640 PRINT
2650 IF SEC < LOW THEN GOSUB 2700: REM WE HAVE A NEW RECORD
2660 IF SEC > LOW THEN GOSUB 2800: REM THE OLD RECORD STILL STANDS
2670 RETURN
2680 REM
2700 REM N E W  L O W  R E A C T I O N  T I M E
2710 IF LOW < > HIGH THEN PRINT "WE HAVE A NEW RECORD"
2720 IF LOW < > HIGH THEN PRINT "   HURRAH!!!"
2730 LOW = SEC
2740 RETURN
2750 REM
2800 REM O L D  L O W  S T I L L  S T A N D S
2810 PRINT
2820 PRINT "YOUR BEST TIME SO FAR IS "; LOW
2830 PRINT "   SECONDS
2840 RETURN
2850 REM
2900 REM G E T  T H E  N E X T  S T E P
2910 PRINT
2920 PRINT "PRESS "; TRYAGAIN$; " TO TRY AGAIN OR "; EXIT$; " TO END"
2930 GET A$
2940 RETURN
3000 END
```

prevent going to the end of the line. Next, multiply the new line length by a randomly generated decimal fraction (RND (1)). Add .5 to that product for rounding, and take the integer value of that sum. Finally, add 1 to the last value, so it will be at least 1. For example, if RND (1) produced the value .001, then you would have Example 1.

Line 2140 centers the title on the screen. Line 2210 clears out any extraneous keyboard entries before the first X is displayed. Lines 2230 and 2240 create a short delay between printing characters. This loop method, before the PRINT "X"; is preferable for three reasons: 1) Some versions of Basic do not have a SPEED = verb; 2) The delay ensures more reserve in the operator's trigger finger; and 3) To delay *after* printing would interfere, though ever so slightly, with the counting in line 2520.

You must be able to check—while printing the X's—whether or not a key is depressed, and give appropriate feedback and handslapping. Otherwise, the operator could get a reaction time of nearly zero by pressing a key before all the X's have finished printing. The operator can never get a perfect score (0 seconds), because line 2520 adds before it tests for a character.

The program causes a raspy noise in lines 2370–2390. Of course, those lines could be replaced by the higher pitched beep in only one line:

```
2370 PRINT CHR$(7)
```

But we like the softer, more humorous rasp for this application.

Line 2540 computes the response time (in seconds), rounded to the nearest thousandth of a second. Example 2 shows how the mathematics works, letting COUNT = 25.

Use the GET A$ verb in line 2930 to halt for a response of *one* character (T or E); you'll find it is easier not having to use the return key.

We have tried to show that Basic lends itself to a Do Until control structure using the Gosub-If. . . Then statements. The complete program is in Listing 3. It should be clear, if the reader begins at the top. We trust you will have a lot of fun with both the program and the concepts in it. ■

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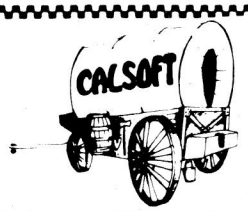


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# EPROM Edification

**Find yourself short of a 2516 EPROM? Use your Apple to program that EPROM. This article shows you how to accomplish this feat. . . in just one day.**

by Joe Magee

It always seems to happen on a Friday evening. The project is nearly completed, but you need one more item. Naturally it's only available during the week. In this case I needed an EPROM programmed. I could go into the office on Saturday, but this was a holiday weekend and even the watchman would be gone.

I had just completed the software for a recently constructed radio Teletype converter. The project used a 6505 microprocessor, so I wrote the assembly-language program using my Apple. The program was to be stored in a TMS 2516 EPROM.

After thinking this over and searching through the junk box, I decided to build my own EPROM programmer. The main ingredient was a 5 V dc to 26 V dc converter I acquired some time ago. A minimum configuration design was required so the project could be completed in less than a day.

Figure 1 is a schematic diagram of the result. I finished the design the night I started the project. Construction, writing the software, and checkout was accomplished the next day.

Simplicity was important. The programmer does just that—program 2516-type EPROMs, and nothing more. No other type of device can be handled and the circuit cannot read an already programmed chip.

### How Do You Program a 2516?

A 2516 turns out to be easy to program. Put an address on the address lines, data on the data lines, 5 V dc to $V_{cc}$, bias a few other pins and hold 25 V dc on pin 18. Then just wait 50 milliseconds and start over again. Once you've figured this out and taught a simple microcomputer how to do it, you'll never have to think about it again. Just sit back and watch.

### The Hardware

Consider the address lines. The addressing technique is not new, but

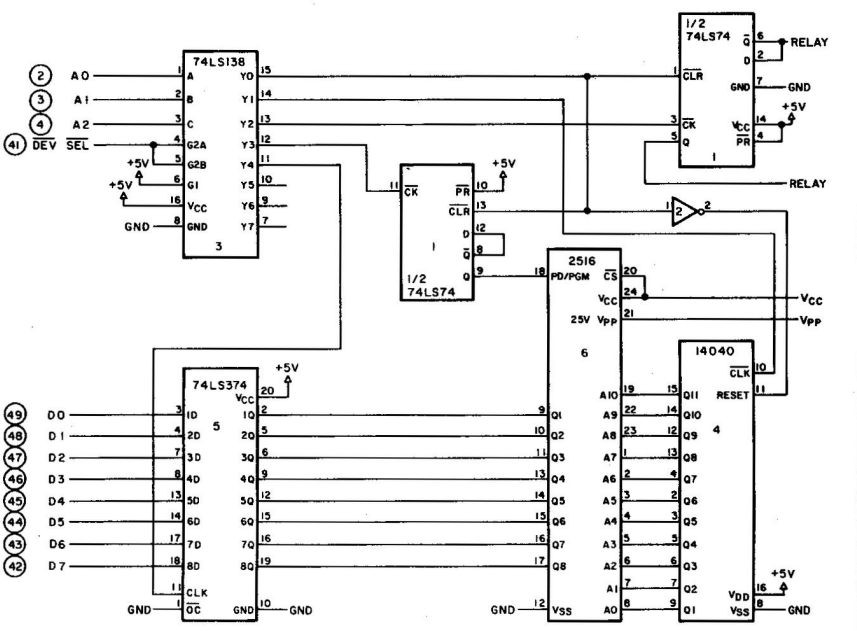


*Figure 1a. Schematic diagram of EPROM programmer.*

*Address correspondence to Joe Magee, PO Box 4337, Irving, TX 75061.*

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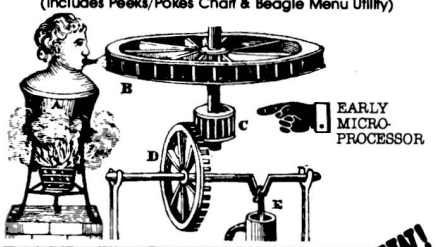


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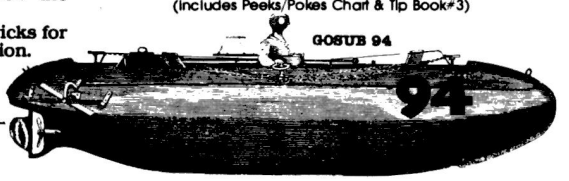


```
10  FOR A = 1 TO 22: PRINT CHR$(ASC (MID$(
    "IJ—!IPX(T!ZPVS!TJTUFS@", A, 1))—A/A);
20  FOR B = 1 TO 4: C = PEEK(49200): NEXT B, A
```

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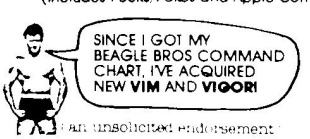


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| SAVE 60-SECTOR PROGRAM | 24 sec. | 9 sec. |
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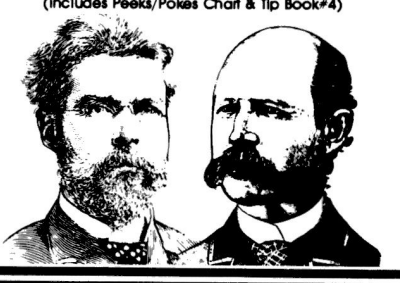

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```
C080-           1000 RESET  .EQ $C080     RESET PROGRAMMER
C081-           1010 BMPADR .EQ $C081     BUMP ROM ADR
C082-           1020 RELAY  .EQ $C082     TOGGLE RELAY
C083-           1030 PGM    .EQ $C083     TOGGLE PGM PIN
C084-           1040 DATA   .EQ $C084     STORE DATA IN LATCH
FDF0-           1050 COUT1  .EQ $FDF0     CHAR TO SCREEN ROUTINE
FF69-           1060 MONITR .EQ $FF69     MONITOR RETURN POINT
FC58-           1070 CLEAR  .EQ $FC58     CLEAR SCREEN ROUTINE
FD0C-           1080 RDKEY  .EQ $FD0C     GET KEY STROKE
000D-           1082 CR     .EQ $0D       ASCII CARRIAGE RETURN
0000-           1090 PRTPTR .EQ $00       PRINT STRING POINTER
0002-           1100 BUFFER .EQ $02       POINTER TO MEM BUFFER
0004-           1110 SLOT   .EQ $04       SLOT NUMBER
0005-           1120 COUNT  .EQ $05       DELAY COUNT
                2000        .OR $8000     START LOC
8000-           2010 START  .EQ *         START OF PROGRAMMER
8000- 20 58 FC  2020        JSR CLEAR     CLEAR SCREEN
8003- AD B2 80  2030        LDA GETSLT    MESSAGE ADR HI
8006- 85 00     2040        STA PRTPTR    SAVE
8008- AD B3 80  2050        LDA GETSLT+1  MESSAGE ADR LO
800B- 85 01     2060        STA PRTPTR+1  SAVE
800D- 20 84 80  2070        JSR PRINT     PRINT MESSAGE
8010- 20 0C FD  2080        JSR RDKEY     GET INPUT DATA
8013- 20 F0 FD  2090        JSR COUT1     ECHO IT
8016- 29 7F     2100        AND #$7F      MASK OFF MSB
8018- C9 38     2110        CMP #$38      A GOOD NUMBER?
801A- 10 E4     2120        BPL START     IF NOT GOOD, START OVER
801C- 29 0F     2140        AND #$0F      MASK ASCII PORTION
801E- 0A        2150        ASL           SHIFT TO LEFT HALF
801F- 0A        2160        ASL
8020- 0A        2170        ASL
8021- 0A        2180        ASL
8022- AA        2190        TAX           PUT IN INDEX
8023- 85 04     2200        STA SLOT      SAVE IT
8025- BD 80 C0  2210        LDA RESET,X   RESET PROGRAMMER
8028- 20 58 FC  2220        JSR CLEAR     CLEAR SCREEN
802B- AD DF 80  2230        LDA STRMSG    GET START MSG ADR LO
802E- 85 00     2240        STA PRTPTR    PUT IN PTR
8030- AD E0 80  2250        LDA STRMSG+1  GET START MSG ADR HI
8033- 85 01     2260        STA PRTPTR+1  PUT IN PTR
8035- 20 84 80  2270        JSR PRINT     PRINT MSG
8038- 20 0C FD  2280        JSR RDKEY     GET KEYSTROKE
803B- BD 82 C0  2290        LDA RELAY,X   TOGGLE RELAY
803E- A9 64     2300        LDA #100      SET UP 100MS WAIT
8040- 20 9B 80  2310        JSR WAIT      WAIT
8043- A9 00     2320        LDA #00       INIT BUFFER POINTER
8045- 85 02     2330        STA BUFFER    SAVE IT
8047- A9 08     2340        LDA #08       BUFFER STARTS AT $800
8049- 85 03     2350        STA BUFFER+1  SAVE IT
804B- A0 00     2360        LDY #00       INIT INDEX
804D-           2370 GETDTA .EQ *         PROGRAM LOOP
804D- B1 02     2380        LDA (BUFFER),Y GET DATA
804F- 9D 84 C0  2390        STA DATA,X    PUT IN LATCH
8052- BD 83 C0  2400        LDA PGM,X     TOGGLE PROGRAM PIN
8055- A9 32     2410        LDA #50       SET UP 50 MS WAIT
8057- 20 9B 80  2420        JSR WAIT      WAIT
805A- BD 83 C0  2430        LDA PGM,X     TOGGLE PGM PIN
805D- BD 81 C0  2440        LDA BMPADR,X  BUMP PROM ADR
8060- C8        2450        INY           INCREMENT INDEX
8061- D0 EA     2460        BNE GETDTA    IF NOT 256, THEN CONTINUE
8063- A5 03     2470        LDA BUFFER+1  GET CURRENT POINTER
8065- C9 0F     2480        CMP #$0F      CHECK FOR LAST PAGE ($F00)
8067- F0 05     2490        BEQ DONE      IF LAST PAGE AND Y=256, THEN DONE
8069- E6 03     2500        INC BUFFER+1  BUMP PAGE
806B- 4C 4D 80  2510        JMP GETDTA    DO NEXT BYTE
806E-           2520 DONE   .EQ *         PROGRAMMING DONE
806E- 20 58 FC  2522        JSR CLEAR     CLEAR SCREEN
8071- BD 80 C0  2524        LDA RESET,X   TURN OFF PROGRAMMER
8074- AD 2C 81  2530        LDA FINMSG    GET FINISHED MSG
8077- 85 00     2540        STA PRTPTR    SAVE
8079- AD 2D 81  2550        LDA FINMSG+1  GET FINISHED MSG ADR HI
807C- 85 01     2560        STA PRTPTR+1  SAVE
807E- 20 84 80  2570        JSR PRINT     PUT ON SCREEN
8081- 4C 69 FF  2580        JMP MONITR    RETURN TO MONITOR
8084-           3000 PRINT  .EQ *         PRINT MESSAGE ROUTINE
8084- 48        3010        PHA           SAVE A
8085- 98        3020        TYA           GET Y
8086- 48        3030        PHA           SAVE Y
8087- A0 00     3040        LDY #00       INIT INDEX
8089-           3050 PRLOOP .EQ *         PRINT CHAR LOOP
8089- B1 00     3060        LDA (PRTPTR),Y GET DATA
808B- C9 03     3070        CMP #03       END?
808D- F0 08     3080        BEQ PRDONE    YES, EXIT
808F- 09 80     3090        ORA #$80      NO, SET MSB
8091- 20 F0 FD  3100        JSR COUT1     PUT ON SCREEN
8094- C8        3110        INY           BUM INDEX
8095- D0 F2     3120        BNE PRLOOP    PRINT 256 CHARS MAX
8097-           3130 PRDONE .EQ *         PRINTING FINISHED
8097- 68        3140        PLA           GET Y
8098- A8        3150        TAY           PUT IN Y
8099- 68        3160        PLA           GET A
809A- 60        3170        RTS           RETURN
809B-           3180 WAIT   .EQ *         WAIT X MILLISECONDS
809B- 85 05     3190        STA COUNT     SAVE WAIT COUNT
809D- 48        3200        PHA           SAVE A
809E- 8A        3210        TXA           GET X
```

*Listing continued.*

*Listing.*
*Control program for EPROM programmer.*

perhaps doesn't come to mind on first thought. Remember that this was a program-only circuit, and that one usually starts at the beginning and programs to the end, so a multistage binary counter chip easily handles address generation.

In this case, U4, an MC14040, is used to generate the addresses. At the start it is reset to 0, and incremented one time after each location is programmed. The address count is advanced by reading a certain memory location in the Apple, which causes an address decode strobe to occur. This strobe is fed to the clock pin of the MC14040, which increments the count, and thus the address, one time.

Data must be held steady during the program pulse. A 74LS374 latch, U5, is used. It is loaded by writing the desired data to another address in the Apple. I'll discuss these Apple addresses later.

Two other functions must also be handled—power to the 2516, to the dc to dc converter, and the program pulse. Each of these is provided by one half of U1, a 74LS74 flip-flop. Each time a certain Apple address is accessed, one of these flip-flops will toggle. One is tied to a relay that powers the 2516 and dc to dc converter, while the other half is tied directly to the program pin of the EPROM.

Address decoding is central to making this device work. The signals appearing on the Apple back plane are utilized by a single 74LS138 decoder, U3.

By using A0, A1, A2 and $\overline{\text{DEVSEL}}$ from the Apple, eight functions can be implemented. Reading one of the 16 device addresses for the PROM programmer's slot will cause one of the eight outputs of U3 to go low during the read instruction. Since only A0, A1 and A2 are used in the decode, any one output line will respond to a read from one of the eight low and eight high addresses of the 16 available to a slot.

In the programmer, five functions are used, so five addresses are used. Function 1, or device address 0, is the reset for the programmer. Assuming the programmer is in slot 4, it could be reset by reading location $COCO.

In the programmer, five functions are used, so five addresses are used.

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*Listing continued.*

```
809F- 48        3220         PHA            SAVE X
80A0- 98        3230         TYA            GET Y
80A1- 48        3240         PHA            SAVE Y
80A2- A6 05     3260         LDX COUNT      GET MS COUNT
80A4-           3262 WLOOP1  .EQ *          OUTER LOOP
80A4- A0 CC     3270         LDY #$CC       GET COUNT FOR 1 MS
80A6-           3272 WLOOP2  .EQ *            INNER LOOP
80A6- 88        3280         DEY            DECREMENT 1 MS COUNT
80A7- D0 FD     3290         BNE WLOOP2     KEEP UP FOR 1 MS
80A9- CA        3300         DEX            DEC COUNT
80AA- D0 F8     3310         BNE WLOOP1     DECREMENT TOTAL COUNT
80AC- 68        3320         PLA            GET Y
80AD- A8        3330         TAY            PUT IN Y
80AE- 68        3340         PLA            GET X
80AF- AA        3350         TAX            PUT IN X
80B0- 68        3360         PLA            GET A
80B1- 60        3370         RTS            RETURN
80B2-           3500 GETSLT  .EQ *          GET SLOT # MSG
80B2- B4 80     3510         .DA GETSLT+2   POINTER TO STRING
80B4- 20 20 20
80B7- 20 20 20
80BA- 20 20 20
80BD- 20 20 20
80C0- 32 35 31
80C3- 36 20 50
80C6- 52 4F 47
80C9- 52 41 4D
80CC- 4D 45 52  3520         .AS "             2516 PROGRAMMER"
80CF- 0D        3530         .DA #CR
80D0- 0D        3540         .DA #CR
80D1- 53 4C 4F
80D4- 54 20 4E
80D7- 55 4D 42
80DA- 45 52 3D
80DD- 3F        3550         .AS "SLOT NUMBER=?"
80DE- 03        3560         .DA #03
80DF-           3570 STRMSG  .EQ *          START PROGRAMMING MSG
80DF- E1 80     3572         .DA STRMSG+2
80E1- 20 20 20
80E4- 20 20 20
80E7- 20 20 20
80EA- 20 20 20
80ED- 32 35 31
80F0- 36 20 50
80F3- 52 4F 47
80F6- 52 41 4D
80F9- 4D 45 52  3580         .AS "             2516 PROGRAMMER"
80FC- 0D        3590         .DA #CR
80FD- 0D        3600         .DA #CR
80FE- 50 4C 41
8101- 43 45 20
8104- 32 35 31
8107- 36 20 49
810A- 4E 20 53
810D- 4F 43 4B
8110- 45 54 2E  3610         .AS "PLACE 2516 IN SOCKET."
8113- 0D        3620         .DA #CR
8114- 50 52 45
8117- 53 53 20
811A- 41 4E 59
811D- 20 4B 45
8120- 59 20 54
8123- 4F 20 53
8126- 54 41 52
8129- 54 2E     3630         .AS "PRESS ANY KEY TO START."
812B- 03        3640         .DA #03
812C-           3650 FINMSG  .EQ *          DONE MESSAGE
812C- 2E 81     3652         .DA FINMSG+2
812E- 20 20 20
8131- 20 20 20
8134- 20 20 20
8137- 20 20 20
813A- 32 35 31
813D- 36 20 50
8140- 52 4F 47
8143- 52 41 4D
8146- 4D 45 52  3660         .AS "             2516 PROGRAMMER"
8149- 0D        3670         .DA #CR
814A- 0D        3680         .DA #CR
814B- 50 52 4F
814E- 47 52 41
8151- 4D 4D 49
8154- 4E 47 20
8157- 44 4F 4E
815A- 45        3690         .AS "PROGRAMMING DONE"
815B- 03        3700         .DA #03
                9990         .EN
```

Function 1, or device address 0, is the reset for the programmer. Assuming the programmer is in slot 4, it could be reset by reading location $COCO.

The reset turns off power to the EPROM socket and 26 V converter, and it puts a logic low on the program pin of the memory. It also clears the address counter to 0.

Function 2, address 1, increments the address counter. This is done between successive program pulses.

Function 3 is to turn power to the EPROM and 26 V converter on or off.

Function 4 is to make the EPROM program pin high or low.

Function 5 is to latch the device data on the EPROM data pins.

Function 1, reset, is accomplished when U3 pin 15 goes low. This low pulse resets both halves of U1, making pins 5 and 9 go low. The reset signal is inverted by U2 and the high-going level resets the address counter, U4.

The address counter increment, function 2, is done when U3 pin 14 goes low. This signal is connected to U4 pin 10, the MC14040 clock pin. The low-going pulse causes the counter chain to increment by 1.

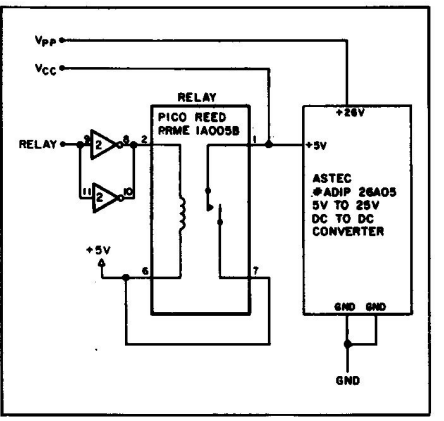
The programming voltage (26 V dc) and 2516 $V_{cc}$ (5 V dc) are controlled by function 4. Whenever U3 pin 13 goes low, the state of U1 pin 5 changes (or toggles). When this pin is low, there is no program voltage or $V_{cc}$. When it goes high, a relay is engaged that supplies $V_{cc}$ to the 2516 and power to the dc to dc converter. A relay is used so there will be no voltage drop on the 5 V line going to the EPROM or converter. The relay is driven by two TTL gates to ensure that enough current is available for the relay coil.

Finally, function 5 is to latch or hold the desired data pattern on the EPROM data pins. When U3 pin 11 goes low, and then high, the data on the Apple data bus as the signal goes high is latched onto U5's Q lines and held. The proper data is put there by executing a STA (store accumulator) instruction to the address, which will cause U3 pin 11 to go low.

### The Software

Most of the control program (see the program listing) could have been

*Figure 1b.*
*Schematic of relay indicated in Figure 1a.*




```
C081- BMPADR
0002- BUFFER
FC58- CLEAR
0005- COUNT
FDF0- COUT1
000D- CR
C084- DATA
806E- DONE
812C- FINMSG
804D- GETDTA
80B2- GETSLT
FF69- MONITR
C083- PGM
8097- PRDONE
8084- PRINT
8089- PRLOOP
0000- PRTPTR
FD0C- RDKEY
C082- RELAY
C080- RESET
0004- SLOT
8000- START
80DF- STRMSG
809B- WAIT
80A4- WLOOP1
80A6- WLOOP2
```

*Table 1.*

written in Basic. Indeed, some of the debugging was done with Basic programs, but Basic is too slow for the operational program. The final software is all assembly language.

The software resides in Apple RAM and must be read in from disk or tape. The starting address is hexadecimal 8000, for convenient use with the SC Assembler, Disk Version 4.0. This particular program will take the contents of Apple RAM from $800 to $FFF and write it into the EPROM.

Lines 1000 to 1120 are equates. This is to assign names to certain numerical constants used in the program.

From 2000 and 2120 the Apple I/O slot containing the programmer is obtained from the user. A check is made to ensure that it is a legal slot number.

2140 to 2200 transform the ASCII slot number into a hex number that can be used by the program.

Line 2201 resets the programmer. This is accomplished as described in the hardware section. From 2220 to 2300 a message is displayed on the screen instructing the user to put the EPROM into the socket and push any key to start. After a key is pressed, the program waits 100 milliseconds to ensure the relay is closed and the program voltage has built up.

Starting with the label GETDTA, the actual loop for putting data in the EPROM is listed. First the data is taken from the buffer ($800 to $FFF) and stored in the data latch. Then the PROGRAM pin flip-flop is toggled. Since the last thing done to it was a reset, it was off. This toggle makes the EPROM pin 18 go high. Next, 50 milliseconds are allowed to pass. After this time, the PROGRAM flip-flop is toggled again to make pin 18 low. Following this, the address counter is incremented by 1 and the buffer pointer is incremented by 1. If the buffer pointer is about to be made $1000, the programming session ends. Otherwise, control returns to the retrieval of data from the buffer and the process is repeated.

At the end, the programmer is reset removing $V_{cc}$ and 26 V from the EPROM. A message is displayed advising the user to remove the programmed part.

The remainder of the program contains two utility subroutines. Print will take a pointer and, starting with data it points to, work its way through memory, sending the data to the Apple display routine until an ASCII ETX ($03) is encountered. Wait is simply a routine that executes for the number of milliseconds that corresponds to the contents of the accumulator.

### Is That All?

This project began and stayed simple, and accomplished its goal—an easily designed and constructed 2516 programmer. Of course, other features are highly advisable. Next month, in Part 2 of this article, I'll describe adding the ability to read EPROMs into Apple memory. With additional software you can copy EPROMs or edit the contents of an existing EPROM and make another. ■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| BLOAD* | 9.5 sec. | 2.6 sec. |
| READ** | 42.2 sec. | 12.4 sec. |
| WRITE** | 44.6 sec. | 14.9 sec. |
| APPEND** | 21.3 sec. | 2.3 sec. |

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# Impressed With Labels

**Labels containing wit or whimsy, work or wonder, easily printed at a moment's notice. You supply the printer, we've supplied the program...**

**by W. J. Burkhard**

*Listing. Label Printer in Applesoft Basic.*

```
100  REM   ***LABEL PRINTER-2
110 D$ =  CHR$ (13) +  CHR$ (4)
130  GOTO 2500
600  REM  ***DATA ENTRY
610  HOME : VTAB 3
615  PRINT "USE "LL" OR FEWER CHARACTERS PER LINE": PRINT : PRINT

620  FOR I = 1 TO 4
630  PRINT "ENTER LINE NUMBER "I"
635  PRINT I") ";: GOSUB 1200:N$(I) = N$
640  IF  LEN (N$(I)) > LL THEN  PRINT  CHR$ (7): PRINT "LINE TOO
LONG--": PRINT "PLEASE USE "LL" OR FEWER CHARACTERS.": GOTO 635
650  NEXT I
660  PRINT : PRINT "HOW MANY LABELS ": INPUT "DO YOU WANT TO PRINT?
";NL
700 PP = 0:J = NL - 1: GOSUB 1000
710  PRINT "TO MAKE CHANGES, PRESS 'ESC'  "
720  PRINT : PRINT "TO PRINT "NL" LABELS, PRESS 'P'"
725  PRINT : PRINT "BE SURE YOUR LABELS ARE IN POSITION ";
730  GET X$: PRINT
740  IF X$ = "P" THEN J = 0:PP = 1: GOSUB 2950: GOSUB 1000: GOTO
770
750  IF  ASC (X$) = 27 THEN  GOSUB 1000: GOTO 870
760  IF X$ <  > "P" AND  ASC (X$) <  > 27 THEN 730
770  HOME : VTAB 4: PRINT "YOU MAY:": PRINT
775  PRINT "1- PRINT MORE OF THE SAME"
778  PRINT "2- MAKE CHANGES"
780  PRINT "3- MAKE OTHER LABELS"
785  PRINT "4- QUIT"
790  PRINT : PRINT "CHOOSE BY PRESSING 1, 2, 3, OR 4";
795  GET X$: IF  VAL (X$) < 1 OR  VAL (X$) > 4 THEN 795
800  IF X$ = "1" THEN  PRINT : PRINT : PRINT "BE SURE THAT LABELS
ARE IN POSITION": PRINT : INPUT "HOW MANY DO YOU WANT TO PRINT?";NL:J
= 0:PP = 1: GOSUB 2950: GOSUB 1000: GOTO 770
805  IF X$ = "2" THEN PP = 0: GOTO 870
810  IF X$ = "3" THEN  HOME : VTAB 4: GOTO 600
820  IF X$ = "4" THEN  HOME : END
```

*Listing continued.*

If you've ever spent tedious hours addressing envelopes for your club, group or business, you'll appreciate the ease with which your printer can handle this repetitive task for you. Enter the data just once, and you can print out mailing labels quickly and easily whenever you need them.

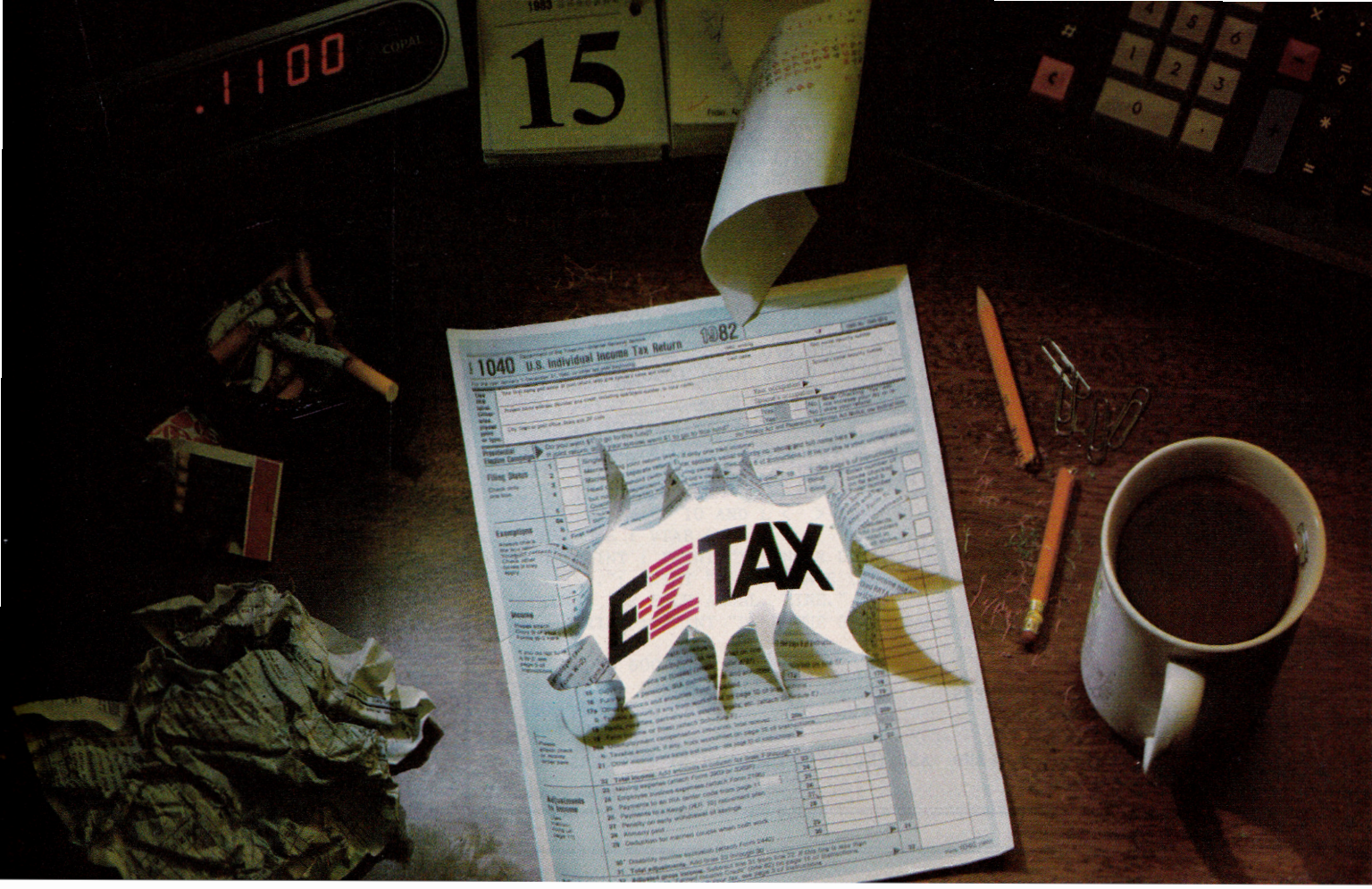
Pressure sensitive labels come in a number of sizes and configurations. The rolls of labels come one, two or three across on a release backing punched for pin or tractor feed. A single column of labels, each 3½ inches wide by $^{15}/_{16}$ inches deep, is convenient, but your tractor must adjust to fit the narrow rows of sprocket holes.

### Using the Program

The Label Printer program in the listing is self-prompting. First select printer pitch (10 or 12 characters per inch). The program then asks for data. You can make changes at any time—while you're entering data, after it has all been entered, or after you have printed your labels.

I designed this program to print a four-line address; if you enter an address with fewer lines, the program adds the needed line feeds to keep the labels advancing properly. You will,

*William J. Burkhard (330 Independence Way, Woodstock, GA 30188) is a free-lance writer and consultant.*

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Circle 156 on Reader Service card.

*Listing continued.*

```
870  GOSUB 1000: PRINT : PRINT "WHICH LINE DO YOU WANT TO CHANGE?
": PRINT "PRESS 1, 2, 3, OR 4 ";
872  GET X$: IF  VAL (X$) < 1 OR  VAL (X$) > 4 THEN 872
875 I =  VAL (X$): PRINT : PRINT I"- "N$(I)
880  PRINT : PRINT "ENTER THE CORRECT DATA."
890  PRINT I") ";: GOSUB 1200:N$(I) = N$
895  IF  LEN (N$(I)) > LL THEN  PRINT  CHR$ (7): PRINT "LINE TOO
LONG--": PRINT "PLEASE USE "LL" OR FEWER CHARACTERS.": GOTO 890
397  GOSUB 1000
900  PRINT : PRINT "TO MAKE MORE CHANGES, PRESS 'Y'"
910  PRINT "TO RETURN TO PROGRAM,": PRINT "PRESS THE SPACE BAR ";
920  GET X$
930  IF X$ = "Y" THEN  GOSUB 1000: GOTO 870
940 J = NL - 1:PP = 0: HOME : VTAB 6: GOSUB 1000: GOTO 660
1000  REM ***DISPLAY/PRINT
1010  HOME : VTAB 3
1020  FOR I = 1 TO 4
1025  IF PP = 0 AND N$(I) <  > "" THEN  PRINT I"- ";
1030  IF N$(I) <  > "" THEN  PRINT  TAB( 5)N$(I)
1040  NEXT
1050  FOR I = 1 TO 4
1060  IF N$(I) = "" THEN  PRINT
1070  NEXT
1080  PRINT : PRINT
1090 J = J + 1
1100  IF J < NL THEN 1020
1110 PP = 0: PRINT D$"PR#0"
1120  RETURN
1200  REM **GET CHARACTERS
1210 N$ = ""
1220  GET K$: PRINT K$;
1230  IF  LEN (N$) = 1 AND  ASC (K$) = 8 THEN  PRINT " " CHR$ (8);:
```

*Listing continued.*

however, have to check the position of your labels before you begin printing to be sure they are lined up correctly. Most printers add a line feed when they finish printing.

Each time the program finishes printing a batch of labels, it will return you to a menu. You can choose to 1) print more of the same, 2) make changes, 3) make other labels, or 4) quit.

The program will work with any printer capable of printing at least 40 columns. Because there are so many different printers and controller cards, and each has different needs, you may need to change some of the program lines that control printing. I'll point these out later.

### Don't Forget Lowercase

If you have one of the lowercase adapters, or ROMPLUS+ with keyboard filter, you aren't limited to uppercase. Just add a subroutine to turn on the ROMPLUS+ card when the program is run.

### The Program

I wrote the Label Printer program in Applesoft Basic. Line 110 includes the carriage return character (CHR$(13)) along with control-D to define the DOS command D$ because this command is ignored unless it's immediately preceded by a carriage return. The lines beginning at 2500 display the title and instructions on the screen.

The program is set up for a printer with a pitch of 10 or 12 characters per inch. If your printer has provision for characters of other sizes, you may want to make the appropriate changes in lines 2520–2565.

The subroutines beginning at lines 600 and 1200 *get* characters from the keyboard one at a time and count them as they are entered. If the number exceeds your chosen maximum, the string is not accepted and the program will tell you to start that line over. Normally the Apple rejects commas as input, but if you *get* each character as a string, the Apple will accept commas and semicolons.

When you finish entering data, the program gives you another chance to make changes or corrections. This is handled by the subroutine beginning


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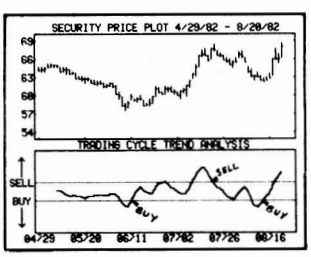

*Listing continued.*

```
GOTO 1210
1240  IF  ASC (K$) = 8 THEN N$ =  LEFT$ (N$, LEN (N$) - 1): PRINT
" " CHR$ (8);: GOTO 1220
1250  IF  ASC (K$) = 13 THEN  RETURN
1260 N$ = N$ + K$
1265  IF  LEN (N$) > LL THEN  RETURN
1270  IF  ASC (N$) = 13 THEN N$ = "": RETURN
1280  GOTO 1220
2500  HOME : VTAB 6: HTAB 6: INVERSE : PRINT " LABEL PRINTER-2  ":
NORMAL
2510  PRINT : PRINT "FOR LABELS ONE ACROSS,": PRINT "  15/16 BY 3
1/2 INCHES."
2520  PRINT : PRINT "YOU CAN PRINT UP TO FOUR LINES ": PRINT "WITH
A MAXIMUM OF:": PRINT "    35 CHARACTERS AT 12 CHAR/IN, OR"
2530  PRINT "    30 CHARACTERS AT 10 CHAR/IN"
2540  PRINT : PRINT "WHICH ARE YOU USING?"
2550  INPUT "PLEASE ENTER '10' OR '12' ";L
2555  IF L = 12 THEN LL = 35
2560  IF L = 10 THEN LL = 30
2565  IF L <  > 10 AND L <  > 12 THEN 2550
2568  HOME : VTAB 4
2570  PRINT : PRINT "TO ENTER DATA,": PRINT "TYPE A LINE AND PRESS
'RETURN'.": PRINT "IF YOU HAVE LESS THAN FOUR LINES,": PRINT "PRESS
'RETURN' FOR EACH ADDNL. LINE."
2580  PRINT : PRINT "PUSH THE SPACE BAR TO BEGIN.  ";: GET X$: VTAB
8
2590  GOTO 600
2950  REM   ***PRINTER ROUTINES
2980  PRINT D$"PR#1"
2990  RETURN
3060  REM  1982  W.J. BURKHARD
```

**"You get another chance to make changes before printing."**

on line 870. Then your screen displays the lines to be printed out, and asks for the number of labels to be printed (line 660). You get another chance to make changes before printing.

The subroutines beginning at line 2950 prepare the printer for action. Line 2980 activates the Apple printer controller in slot #1, which is set to default to 40 columns. To set that card to 80 columns, for example, add the statement PRINT CHR$(9)"80N".

If you are using the SSM controller, add the following line:

```
2982 PRINT:POKE 1145,64:POKE 1657,0
```

This inserts auto line feed and disables the form feed after 57 lines. The display subroutine, lines 1000–1100, is used for printout as well as for display. Line 1110 turns off the printer after printing is completed. The program then returns to the menu, lines 770–785.

### Variables and Strings

N$(I) is the character string, and I is the line number of that string.

LL is the line length (30 or 35 characters).

NL is the number of labels to be printed, and J is a counter that keeps track of the number of labels being printed.

PP indicates whether the printer has been called by the program: 0 if no, 1 if yes.

### Software Printer Drivers

If you use a software printer driver, you will want to delete lines 2980–2990 and add the following lines:

```
 120 GOSUB 3000
3000 PRINT D$"BLOAD PRINTER"
3010 RETURN
```

You must, of course, have a driver program with the name Printer in a binary file on your disk. You would also add the line:

```
2960 CALL 768: RETURN
```

for a driver program located at 768 (decimal). ■


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# You Won a What?

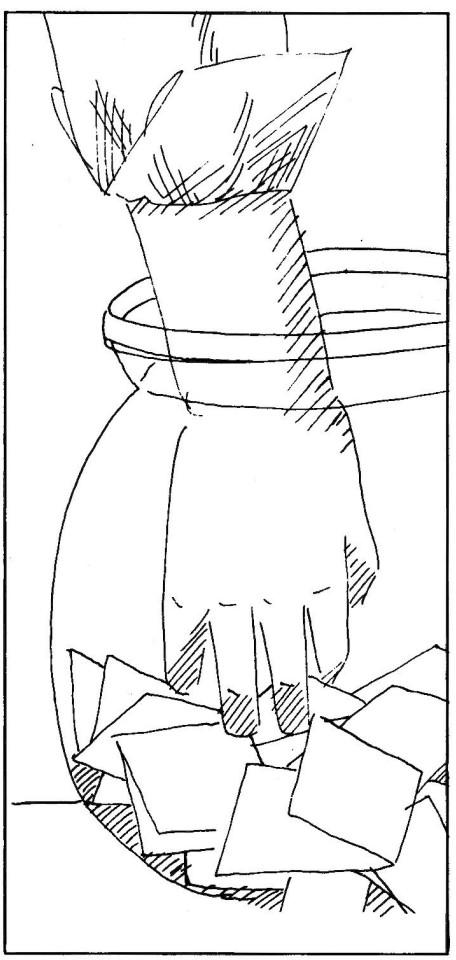
**Life can change forever when a one-dollar raffle ticket drops an Apple in your lap.**

**by Ronald W. DelPorto**

First let's clarify a few things. At heart, I'm a big systems guy. I've worked in a mainframe environment for 10 years. At work we've got an IBM 4341, 8 meg real storage, virtual up to 16 meg, and so on. My job is to encourage and support people who use the system. I love the system—it's great. But, I can't take it home. Also, I can't, shouldn't, wouldn't do any significant personal work on it. It doesn't belong to me.

Since I can't have a mainframe at home (monthly maintenance probably exceeds my salary), I started to think about micros—especially Apple micros, since all the literature and most of my knowledgeable friends tell me that in terms of available software and "bang for the buck," Apple is it. I also do volunteer work as church treasurer, a job that just cries for computerization.

So, how do I get an Apple? Buy one, of course! But is now the time to buy? Should I wait? Can I, or even the church, afford this (to me) unproven box? What can I do with it? Well, I'm sure that eventually I'd have resolved all those questions. Would I (or the church) have bought an Apple? Probably, but now we'll never know, because *I Won An Apple!* Right in the middle of all my research and feasibility studying and planning and procrastinating, I won an Apple.



*Address correspondence to Ronald W. DelPorto, 5237 Aspen Drive, Erie, PA 16506.*

The local chapter of the Data Processing Management Association sponsored a mini-micro computer show and sold tickets on an Apple II Plus. I'd just decided that this probably wasn't the year to squeeze a nearly $3000 luxury item like a computer into the church budget. Oh yes, it is too a luxury item. The treasurer may save time, but note I said *volunteer* above. Whether they double my salary for thinking up such a bright idea or halve it because I'm doing less work, my six figure salary of $000,000 annually remains the same. No savings.

Well, anyway, I'd just decided that when I noticed a sign advertising the DPMA drawing. One dollar each, seven for $5—who could beat it? Even a veteran non-winner (loser is a nasty word) like me couldn't pass up such a chance. I bought seven tickets, threw them in the drawer and didn't even think to mention it to my wife.

They called me Thursday night. "Mr. DelPorto?" "No, I don't want any insurance, siding, magazines, opportunities to contribute to worthy causes, I just... I just won a what?"

I brought it home after work on Friday. Boxes, heavy boxes, light boxes, intriguing boxes. How many boxes doth a computer make? It looked like a major assembly job, for me anyway. You have to understand, I start assembling the kids' Christmas toys in July

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and usually have several done by Easter. My wife assured me there was absolutely no room in the house for anything that big. Hadn't I said it was small? She also suggested we sell it and buy a second car. My kids wanted to know how soon they could start playing games with it, and was I absolutely sure Pac-Man isn't available for the Apple?

I started at 6:15 pm, and by 6:45 pm I was up and running—or rather, the Apple was. My wife had changed her opinion on its space requirements and, almost, on its relative value vis-a-vis a second car. The kids were so far into Stellar Invaders they'd forgotten Pac-Man. It really was easy.

A word about the kids. They have absolutely no fear of the computer. It's just another machine in a world of machines. All those Charlie Chaplin movies and science fiction themes showing man as victim of technology notwithstanding, these modern kids are its masters, not the other way around! At one point I muttered, "Well, how in the world do you know what's on the disk?". With practically one voice my two older ones (13 and 11) shouted, "Oh, you type 'catalog,' Dad. Didn't you know that?" They must be born with such knowledge.

By Sunday night, the kids had played every game we got with the system at least twice and some of them fifty times, my son and I had written a program to randomly generate math drills, I'd written a simple program to help my four-year-old learn the alphabet, and my wife was changing from skeptic to supporter. What a joy to work with a youngster and teach him to program—that is, teach him to think. I think we've seen the last generation that will waste away hours passively watching TV. They're interacting now—learning, getting excited, thinking.

Where to from here? Well, I'm doing some systems design on my church accounting system, and automating a few of my record-keeping tasks around the house. My wife is using the Apple more, the kids are beginning to see it as a tool as well as a super Atari, and I've got plans for more peripherals and software. The computer is as much a part of our lives as the family dog. ■

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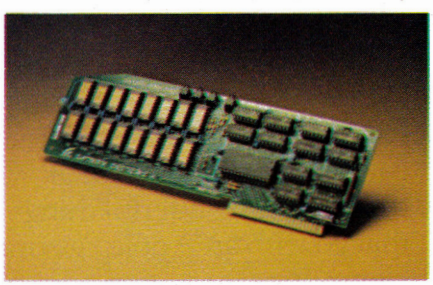

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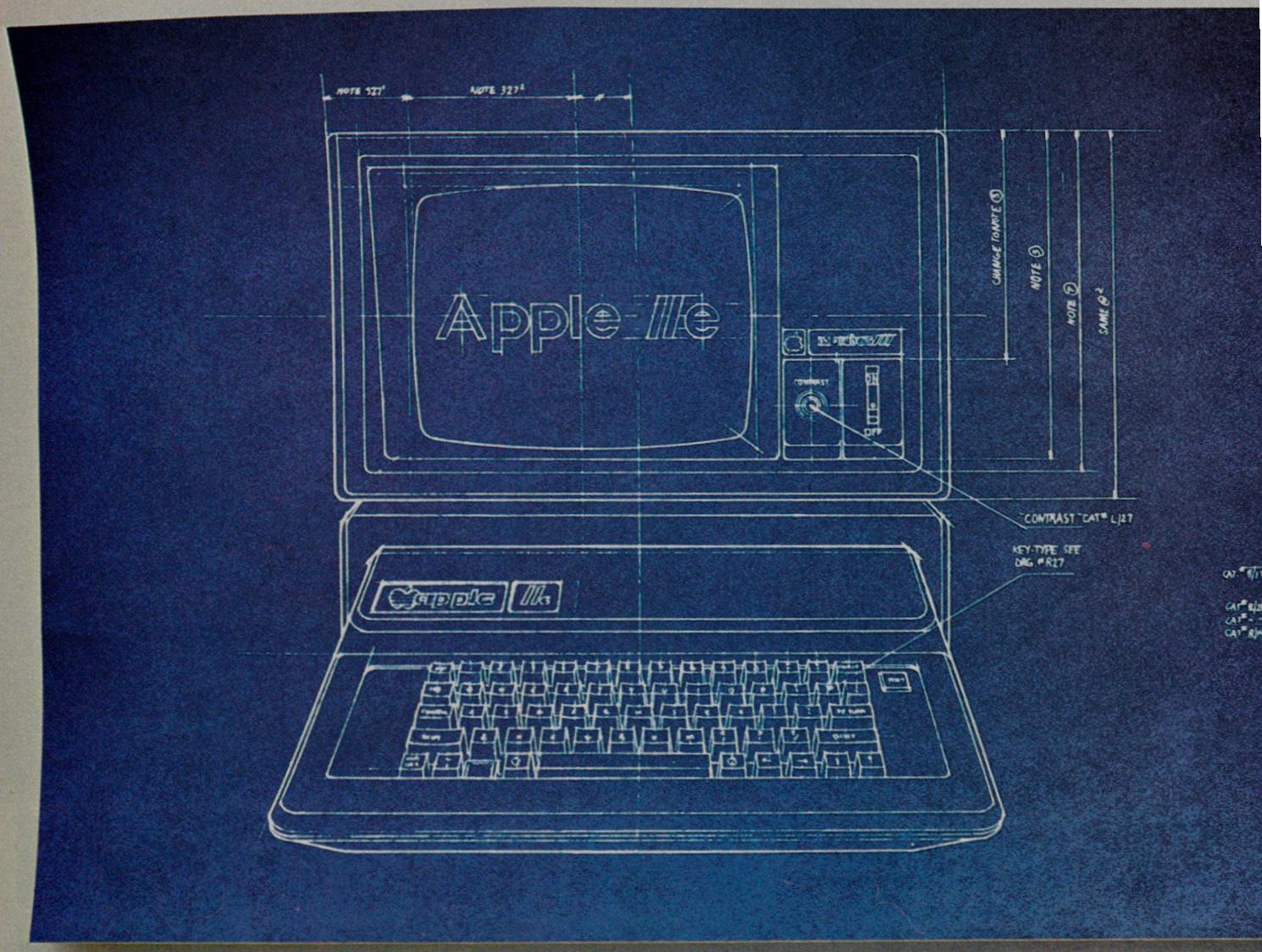


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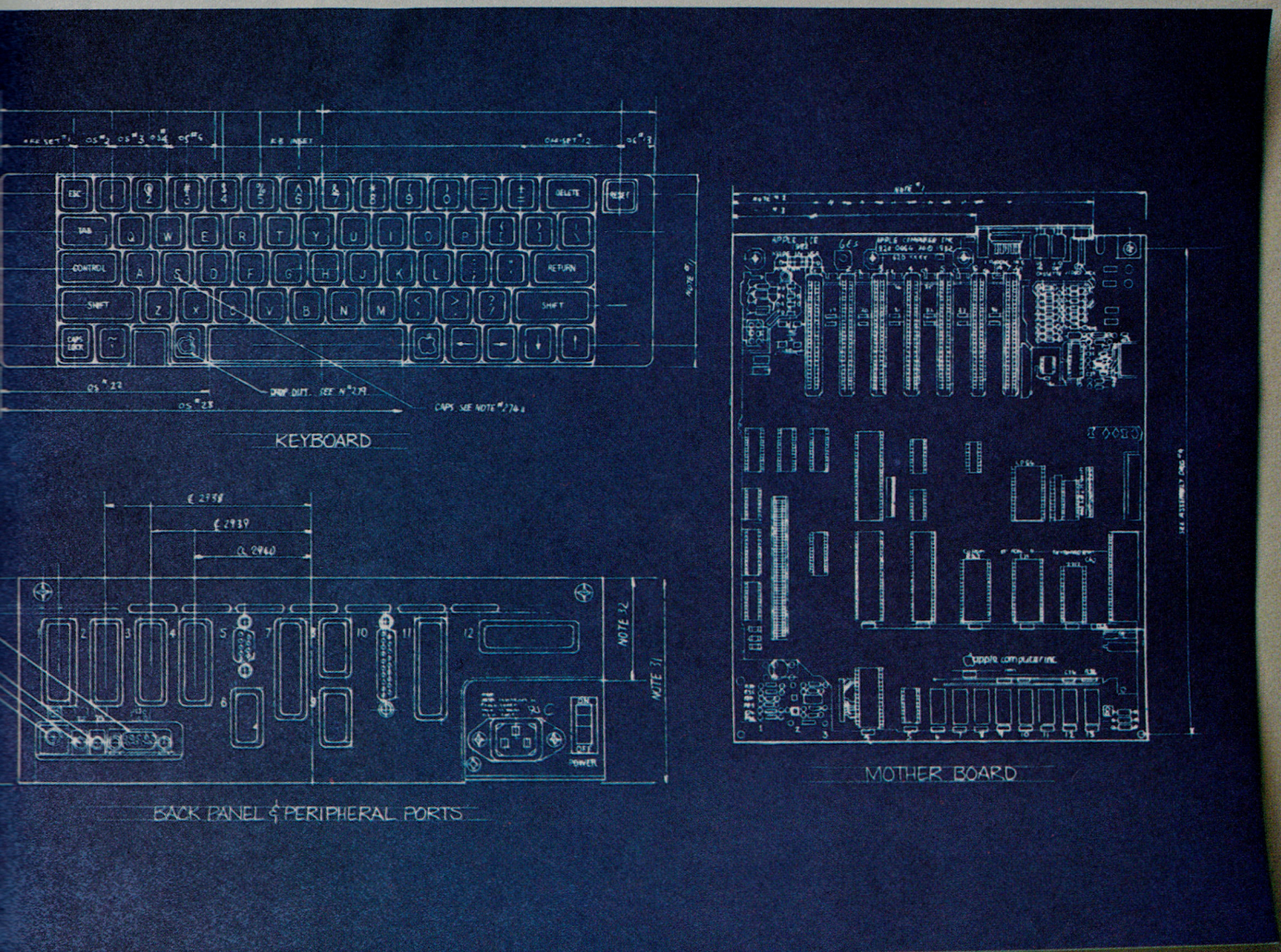


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# Prototyping Precepts

**Wish to interface on a higher level with your Apple II? Well, dream no longer, for here is an instructional article dealing with an I/O prototyping system that'll make experts of us all.**

by Charles Engelsher

Few hobbyists build their own computers from scratch anymore. But, if you're interested in getting under the hood of your machine, the possibilities for enhancing your system are endless. Interfacing your computer for home control, weather watching, communications, music making, robotics and voice synthesis should fill your idle moments for some time to come.

Unfortunately, this involves more than just pulling out a few bus lines and hooking up your device on a breadboard. Relative newcomers might be discouraged by the depth and breadth of material that must first be digested. Still, you needn't be an expert on digital techniques and design, or on computer architecture.

What you need is a flexible yet simple system of externalized data, address and control lines and an accompanying discussion of its operation. The beginner who builds an interface, and understands its basic operation, will find his dreams of controlling the world through peripheral devices more tangible.

Thus, I've tried to keep this discussion as straightforward as possible, using a what-why-how format. I'll explain each element in the interface with reference to signals, functional circuit elements and actual hardware configuration. I touch upon why I chose certain design or construction options over others, citing factors such as cost, convenience of construction and debugging, parts availability, convenience and effectiveness in actual use and flexibility.

### Prototyping System Organization

An interface connects the main system with a peripheral device. Data, address and control lines are brought out and, if necessary, buffered. Buffering is done to maximize a signal's strength and provide reliable driving of other inputs downstream. These buffered signals are connected to so-called port circuitry, which in this case provides eight parallel input and eight parallel output lines.

Figure 1 illustrates this three-element main board-to-port scheme. Two 24-conductor insulated displacement connector (IDC) ribbon cables bring 48 signal lines from a plugboard inserted in one of the peripheral connector slots in the Apple II (RC-A and RC-B). These cables plug into 24-pin sockets at each end (SKT-A and SKT-B), linking the main board peripheral connector slot with a buffer board. Cables A and B are kept short.

After buffering, selected signals required for port operation are distributed to the port circuitry using cables C and D. As given here, the I/O circuitry provides two 8-bit data ports and interrupt capability. This system lets you construct a variety of custom ports, as well as use standard support devices known as peripheral interface adapters (PIA-6520) and versatile interface adapters (VIA-6522). Consideration of these devices is a more ad-

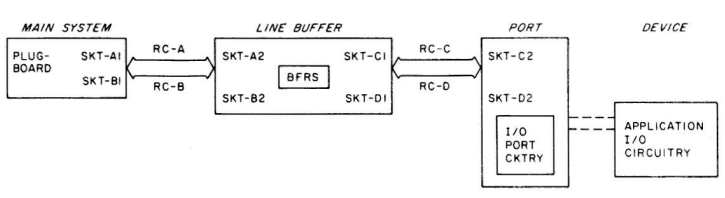


*Figure 1. Prototype Organization: A plugboard is used to externalize needed I/O lines, and line buffer circuitry extends the reach of ordinary IDC cable to port circuitry. These three elements constitute the interface between main system and applications devices.*

*Address correspondence to Charles Engelsher, Box 227, Newtonville, NY 12128.*

vanced topic. However, once you've implemented the current system, you should be able to progress to these and other more sophisticated devices, including the applications circuits, which are the real goal. (See the bibliography.)

### Externalizing System Bus Lines

Despite the term "peripheral slot," the I/O connectors on the Apple main board are not really peripheral. In fact, as is the case on most microcomputers, such edge connectors are not well suited to ready access and manipulation. The simplest solution is to use one of the plugboards made for the Apple I/O slot (see parts list, Table 2, for manufacturers).

Figure 2 shows which lines are connected to which pins on two 24-pin solder-tail sockets. All eight data lines, four address lines (A0–A3), four control lines (R/W, 01, DS, IRQ), 5 V and ground are connected. Unless you're prototyping some fancy daisy-chain DMA setup, these lines are adequate for most applications.

Do not wire-wrap these connections, as the W/W posts can all too easily interfere with boards in adjacent slots. Rather, solder point-to-point wiring between the socket pin and corresponding edge hole. Note that the sequence of externalized lines corresponds almost exactly with the sequence of corresponding signals as diagrammed in the *Apple Reference Manual*.

Now that you've wired two 24-pin sockets to an Apple plugboard, you're ready for cabling. Use rainbow ribbon or IDC cable. Two 24-conductor two- to three-foot lengths will bring the signal lines from the wired plugboard to the outside of the machine. Preassembled cables with plugs attached are available. However, you can save a bit of money and provide yourself with much longer cable assemblies than are commercially offered by making your own, as follows.

Get a solderless breadboarding strip (Radio Shack experimenter socket or equivalent), and push in the bottom part of an IDC cable plug. Align the ribbon cable on top of this, along the two rows of pins, and place the plug cover over this. Now place this four-layer sandwich in the jaws of a vise and crimp it together. You must pad the vise with tape to provide a slight cushion. Be sure to align the long axis of the plug with the long axis of the vise, to assure even pressure.

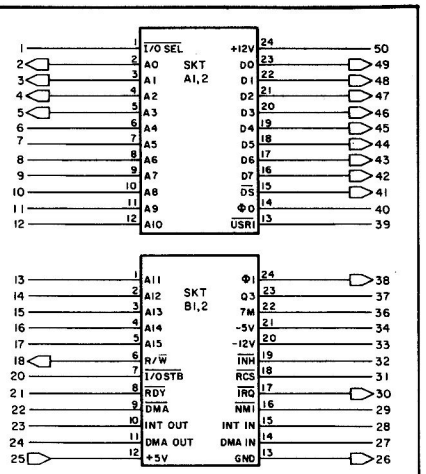


*Figure 2. Peripheral Connector Lines: I/O lines are brought out to two 24-pin DIP sockets on the plugboard. IDC jumper cable extends these lines to the "buffer board" of Figure 3. Open arrows indicate buffered lines. Ground, closed arrow, is not buffered, and the +5 V line supplies power to the line buffer chips only, not to any other circuitry downstream.*

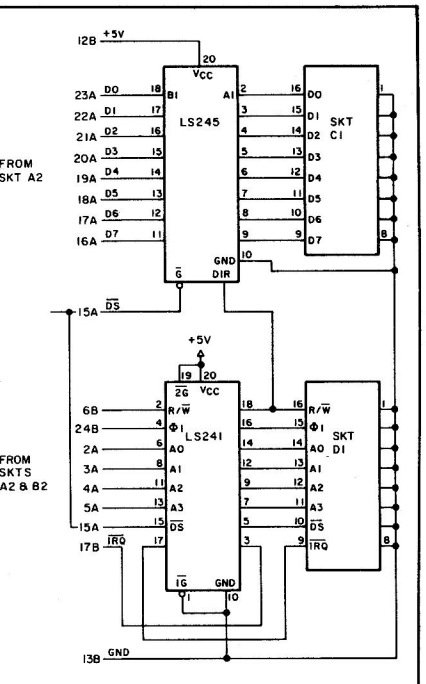


*Figure 3. Line Buffer: A line buffer, consisting of one bus transceiver (LS245) and one bus driver (LS241). On the "system end" of the board is the pair of 24-pin sockets (A2 & B2), while on the peripheral side is the pair of alternate-grounded, 16-pin sockets (C1 & D1), as explained in the text.*

This technique is adaptable to a variety of IDC type assemblies, can save you up to 50 percent in materials cost and gives you flexibility. Keep a stock of 16- and 24-conductor cable and IDC plugs on hand; most signal jumping or distribution tasks for prototyping can be handled with these two flat cable sizes.

The plugboard, cabling and sockets will put you back about $35, but this is a one-time cost.

Are there other options? Yes, but either they involve a significant cost increase and/or the components are not readily obtainable.

Now you can close the hood, and park those cable ends in the solderless socket strip to keep them out of harm's way, while we move on to signal buffering.

### Buffering the I/O Transmission Line

Learning, experimenting and building your own projects requires a flexible prototype system. A key system requirement is an extendible transmission line to carry the needed data, control and address signals to the breadboarding area or to a test bench, and away from a potentially cramped space around the computer. These signals must first be buffered.

To understand the need for buffering, you should know about the concept of fan-out and the problem of transmission line effects. Clearing away all the extraneous theoretical debris, fan-out refers to the driving capacity of a logic gate. It's analogous to the power output of an analog device. Various families of logic devices currently in use differ mainly in their voltage supply requirements, power consumption and operating speed. These characteristics define the various families.

One such family of digital devices is transistor-transistor logic (TTL). In turn, TTL is broken down into subfamilies, which differ from each other in their speed and power characteristics. If we stay within one subfamily, we can conveniently talk about how many other devices of like kind a logic

device can drive. A device belonging to a given subfamily may output a signal to only so many devices of its general type. The output line can be fanned out to only a limited number of similar devices.

If you exceed the fan-out or drive capability of a device, something odd happens. In the case of TTL, the voltage output level that determines the digital signal value—0 or 1—will start to float to an indeterminate level. Instead of having a voltage high near 2.8 to 3.5 V (binary 1) or a low level between 0 and 0.8 volts (binary 0), you may wind up with an ambiguous value, say 1.5 V.

With the popular low-power Schottky TTL device subfamily used here, the fan-out is 20. For example, an LSTTL AND gate will drive up to 20 other LSTTL devices. Fan-out will differ if you attempt to drive devices belonging to other TTL subfamilies.

Table 1 tells you that the drive power of most of the address, data and control lines off the I/O slot are but a fraction of the attainable LSTTL fan-out of 20. The Apple provides all these lines in eight peripheral slots, but has not added the circuitry to buffer, or normalize, the fan-outs to 20. By simply running the signals through devices called buffers (or alternatively, drivers or receivers), you boost the drive power of the signal to its "normal" or unloaded value. Some buffers may augment fan-out to 60 or more, such as the 74LS241 used in the buffer circuit of Figure 3.

Certainly, you'd like to have the greatest safety margin possible, to avoid undue loading on already substrength I/O lines. Therefore, you buffer. But there is another reason: namely, transmission-line effects. Since we are basically externalizing a bus-oriented system on ribbon cable, we wind up with a set of signals running very close together in parallel.

This set of parallel conductors can, in technical parlance, be represented by an equivalent circuit. A typical equivalent transmission line model looks like a set of resistors, inductors and capacitors in various serial and parallel relationships. The inductive and capacitive reactance effects become significant as one increases the transmitted signal's frequency.

| Signals used | Direction | Fan-out in LSTTL Equivalents | |
|---|---|---|---|
| Data D0–D7 | Bidirectional | 1 | .05 |
| Address A0–A3 | Output | 5 | .25 |
| Device Select DS | Output | 10 | .50 |
| Read/Write R/W | Output | 2 | .10 |
| Phase one clock 01 | Output | 2 | .10 |
| Interrupt Request IRQ | Input | 20 | 1.00 |

*Table 1. Fan-out of I/O signals as available from the Apple peripheral slot. Only the ones used in the current scheme are shown. If these "weak" (already loaded) signals are not buffered at least to the normal LSTTL fan-out of 20, indeterminate signal values may result. IRQ is generated by the LS74, has a fan-out of 20, but is buffered anyway.*

| Item and Quantity | Note |
|---|---|
| Apple prototype plugboard | Vector and California Computer Systems carry these boards. |
| 2 three-foot 24-conductor ribbon cable jumpers<br>2 five-foot 16-conductor ribbon cable jumpers | Build your own cables or spend more and buy commercially. See text. |
| 2 24-pin soldertail sockets | For the Apple plugboard. |
| 2 24-pin wire-wrap sockets<br>2 20-pin wire-wrap sockets<br>2 16-pin wire-wrap sockets | These items are needed to W/W the buffer board, if so desired. Otherwise use two Experimentor 300 sockets. |
| Perfboard, OK Tool or Vector daisy chain W/W tool, unwrap tool, etc. | See Bibliography for W/W methods. Great technique after you have debugged or modified the circuit. |
| Solderless Breadboard Radio Shack Experimentor sockets (276-174) | Two for the bufferboard and four for the port circuitry give ample room. |
| Integrated digital prototyping unit, with power, switches, solderless space, etc. | Both Global Specialties and A-P Products distribute such items widely, if you choose to buy rather than build. |

*Table 2. Boards and cabling are components almost as crucial as the ICs themselves, as they provide the mechanical foundation for your creation. A scheme based on solderless breadboard, IDC jumpers, and later perfboard and wire-wrap is quite flexible.*

| Item and Number | Note |
|---|---|
| 2 LS241 | On line buffer board |
| 1 LS240 | Input port buffer |
| 2 LS74 | Interrupt circuit |
| 2 LS75 | Output latch |
| 1 LS04 | Control circuitry |
| 1 LS32 | |
| 8 330 ohm ¼ watt res. | |
| 8 2.2k-ohm ¼ watt res. | Resistor DIPs are more convenient. |
| 1 DIP switch 8 x SPST | |
| 1 SPDT momentary | |
| 8 LEDs | |
| 1 .01 μF disc cap | |
| 1 2.2k res. | |

*Table 3. Components parts list: The ICs are of the 74LSXX series. Shop around, as prices vary.*

In particular, the sharp rise and fall at the leading and trailing edges of a digital pulse looks like a very high frequency to the transmission line. Simply stated, the end result is that the inductive component creates an increased load on the driving device, and the capacitive reactance provides a virtual signal pathway between the conductors. That is, the

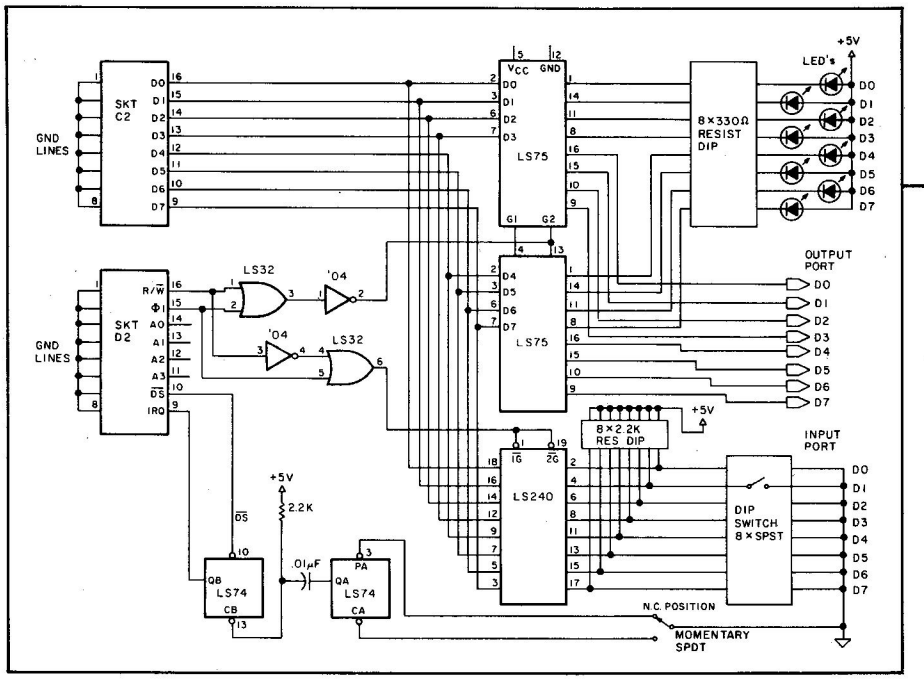


*Figure 4.*
*Port Circuitry: Two 8-bit parallel ports are provided, both input and output, along with provision for echoing the output via LEDs. Interrupt circuitry is included. This is only one of very many alternatives.*

signal is attenuated down the line, and crosstalk occurs between lines.

The result is very messy if you scope it (assuming you have something to trigger off of). And there's more. The transmission line acts like a tuned circuit, creating ringing effects. Then there is propagation delay, as well as reflection artifacts. Also, a certain amount of signal radiation occurs at higher frequencies because extended lines can act as antennae.

Obviously, placing I/O lines on a leash lets you avoid the potential clutter of tools, wire and test equipment that would accumulate around the machine during the prototyping process. It also would appear that distributing those signals down that extended transmission line is an enterprise fraught with problems. But not so. Refer to Figure 3. The data pass in either direction through the bidirectional buffer device 74LS245 (bus transceiver), and the control and address signals pass through the unidirectional buffer 74LS241 (a noninverting driver).

These signals are now normalized to a standard drive capability for such buffer devices. In fact, as mentioned earlier, LSTTL buffer/driver-type devices are made to give a threefold fan-out increase over their LSTTL brethren. This fan-out of 60 is quite ample to drive extended transmission lines.

But brute drive power alone is not enough. Crosstalk, related to power radiation and capacitive coupling effects between lines, creates noise in a big way. Figure 3 shows a simple and cheap solution to this set of crosstalk effects. The 16 signals are passed in two groups: data via socket C1, and control and address signals via socket D1.

These sockets are wired with pins 1–8 on each connected to Apple's groundline. As a result, every other line on the flat cable is a ground line. This method of alternate grounding of ribbon cable lines markedly reduces crosstalk-related noise, a fact you can verify with an oscilloscope.

It works because a ground line is interposed between each signal line, reducing capacitive and radiational effects. You now have two 16-conductor cables, which can be five feet or more in length. You should find the resulting long leash a great boon, as you can drag the I/O lines to an assembly area, a test bench or wherever.

What are the options? The main one is 25-conductor twisted pair cable, using DB-25 type connectors and associated hardware. The ability of these lines to carry signals a fair distance (up to 50 feet) is based on the same idea mentioned above, interposition of ground lines, only more efficiently done. Of course these assemblies are much more expensive. Home assembly is rather laborious, too. But price isn't the only factor, as you will still require ribbon-type jumpers at various points in most prototype systems. DB-25 cable is indispensable in many situations, but stick with ribbon for this one.

In constructing the line buffer of Figure 3, you might first use solderless breadboard; two Experimentor 300 sockets (Global type from Radio Shack) clipped together will do fine. Wire-wrap or printed circuit fabrication can come later, after you've tested the whole system. Note that the bus transceiver LS245 is enabled only when DS is low—that is, when one of 16 addresses in the allotted I/O space for the slot is on the address bus.

Any further address decoding is done downstream, using the four address lines A0–A3 for a total of 16 addresses. Using DS in this way further simplifies the control circuitry in the I/O port: It is not needed there, as its function of electrically isolating the peripheral data signals from the system data bus by controlling the LS245 has been accomplished in this line buffer element.

### I/O Port Circuitry

In memory-mapped input/output microprocessors like the 6502, the I/O locations are addressed just like any other locations in RAM or ROM. Such microprocessor-based systems are set up with blocks or sections of memory variously devoted to RAM, ROM or I/O. Memory maps from the manufacturer's documentation will detail the allocation of memory to these functions; the *Apple Reference Manual* contains such information.

Typically, some mid-range of memory will be devoted to I/O, and in the Apple the interval from $C000–CFFF is used. So-called "on board I/O" functions such as keyboard, speaker, game paddle, cassette, etc., occupy $C000 to $C07F. I/O register space occupies $C080–$C0FF, that is eight little blocks of 16 locations each.

Each set of 16 locations is devoted to an individual slot, so that the block of registers for a given slot, numbered 0–7, has the form $C0NX, where N = (slot number + 8), and X takes on the range of $0 through $F.

Examining the circuit in Figure 4, you will note that none of the address lines, A0–A3, have been used. This means that if you access *any* address in the range of space allotted to the slot, you will access all locations in that 16-address range. It's as if the input and output ports respond to 16 different addresses! That's okay

DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIV

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**"The ability to latch and hold the data, and to provide complementary lines to drive the LEDs, justifies choosing the LS75."**

though—unless you want to add more ports, there is no reason to burden yourself with extra decoding circuitry.

Another aspect of this incomplete decoding scheme is that the input and output ports respond to the same address. This may seem odd at first, but these ports are not responding simultaneously. The control gates (LS32s) use the R/W signal to turn on the input (read) and output (write) chips at different times, depending on whether the 6502 is performing a read or write operation. This R/W line is put high or low, for read or write respectively, by the 6502; this is not something you have to manipulate yourself.

The block diagram of Figure 1 indicates a port circuitry module. The minimum configuration should include two 8-bit parallel ports, one each for input and output, as well as interrupt handling capability. Two Intel 8212s or Texas Instruments 74s412s provide these facilities. They are "multimode, tri-state buffered latches."

These equivalent devices still require some gating or control circuitry; you would also have to add some buffers if you wanted indicator LEDs to echo the output port data. While they appear widely in hobbyist and manufacturer literature, such devices do not significantly reduce the chip count or the overall cost of the basic I/O scheme considered here.

Instead, the desired functions have been built up from simpler chips, as shown in Figure 4. This scheme has the added value for the beginner of making the control, display, interrupt and other functions explicit. Because they are not buried in the innards of a single chip, they may be better understood.

Data signals are brought in onto SKT-C2 and distributed to two double rail 4-bit latches, the LS75s. The total of eight flip-flops latch and hold the data when the R/W and 01 signals are both zero. One rail of each F/F holds the bit value of its respective input data line, the other rail (inverse output of a F/F) provides for echoing of the bit value by means of an LED.

The ability to latch and hold the data, and to provide complementary lines to drive the LEDs, justifies choosing the LS75. It is one of the few chips that fulfills these requirements, and is cheap and readily available.

The input section is equally straightforward. A tri-state inverting driver is used. Closing one of the DIP switches grounds the input, which is inverted to a logical high. This is seen on the data lines only when the device is enabled by a R/W of 1 and a clock-1 value of 0. The 2.2k-ohm DIP pack-


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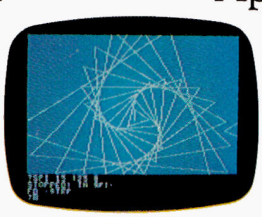

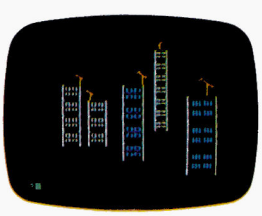

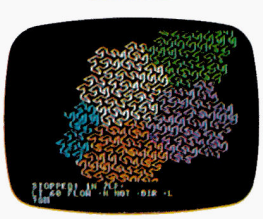

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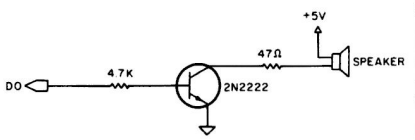


*Figure 5. Speaker Bit: General purpose NPN transistor 2N2222, or any similar device, is used to drive a small speaker in an off or on (saturated) mode. This is definitely not the beginnings of a synthesizer.*

age pulls up the input lines to 5 V when the respective switch is open, giving a logical low on the output side of the device.

Finally, the LS74s and a momentary SPDT toggle or push-button switch constitute the interrupt element in this circuit. The first D flip-flop acts as a key debouncer. The capacitive coupling from this F/F to the clear line of the second F/F acts as a spike or edge generator (differentiator). Since clear lines on most F/Fs are edge triggered, this immediately creates a low on Q-b, which is the interrupt line.

IRQ (maskable interrupt) is an active low, and so the interrupt handling routine takes over. Of course, this line has to be deactivated in due time; otherwise, an endless series of interrupts would be generated by the low on the IRQ line. DS provides for this by presetting Q-b back to 1 when the handler routine accesses the I/O port. The timing diagram for a simulated interrupt sequence, initiated by pushing the button, is given in Figure 7.

Construction is again done on a solderless breadboard; but this time it is best to power the circuit separately. Although the ground of this separate power supply must be connected with the ground line coming from the Apple (common ground), it is wise to avoid the risk of overloading or otherwise damaging the rather expensive power package in your machine.

Modular breadboards including a 5 V supply, adequate solderless breadboard space, and even data switches and logic indicators, are available. One of these, or a similar home-built job, is a must for any prototyping work.

When you do decide to wire-wrap the circuit on perfboard, by all means use one of the daisy chain tools: OK's Just Wrap or Vector's Slit 'n' Wrap. Measuring, cutting and stripping each and every wire, as is necessary on the simpler tools, is avoided with such tools.

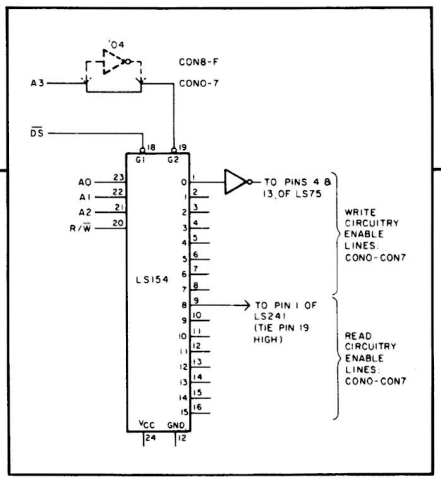


*Figure 6.*
*Port Expansion: Full decoding of the four lower address lines along with the R/W and D/S lines can provide for up to 32 I/O ports.*

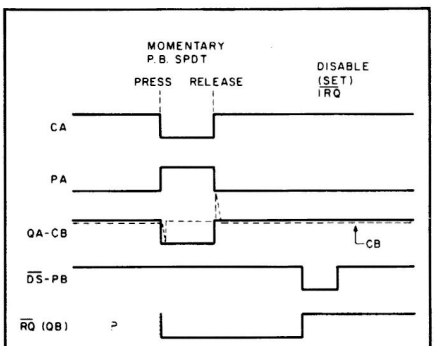


*Figure 7. Interrupt Timing: A clean active low pulse on the IRQ line is generated by the LS74 D-type flip-flop. The capacitor differentiates the noncomplementary output of the first F/F to clear the second by means of a negatively going edge (dotted line). This edge-triggered clear line (C-b) results in an active low on Q-b, which is the IRQ line. DS presets the IRQ back to 1 (deactivated level) when the handling routine accesses the port. Refer to the LS74s in Figure 4.*

## Test/Demo Program

Figure 5 diagrams a simple speaker circuit. Any general purpose NPN transistor will do, along with any 2-inch speaker. Logical 0 (0 to .8 V) will turn the transistor off, while a logical 1 (about 2.8 to 3.5 V) will turn it on, with resultant current flow through the speaker coils. The transistor is either off or it's saturated, and transition between the two states will cause a speaker click. Attach the input (base) to the D0 bit. This circuit is used to generate sound, which will signify the correct operation of both the circuitry and the interrupt handling routine.

Listing 1 is self-explanatory as a test program of output. It simply takes any keypress and outputs the value to the range of addresses in slot 4, where the plugboard resides for the test. If your board is in another slot, use the value $C0N0 where N = (8 + slot #). Remember, for simplicity we have not decoded any of the 16 possible addresses in the given slot's I/O space.

Listings 2a and 2b provide a test for both input and output ports and of the interrupt circuitry. The Basic Listing 2a yields a display of running LEDs whose speed can be varied using paddle 1, and whose direction can be reversed with a keypress.

You may see the interrupt facility in action by typing in Listing 2b from monitor or assembler and saving the object code to disk with the name IRQ DEMO/$300. The hex suffix is just a reminder as to where the code should be placed when BLoaded from disk.

Now run the program of Listing 2a, and vary the speed and direction of the LEDs. Make sure the DIP switch is set to something other than zero, then activate the momentary SPDT switch. The resulting tone can be varied by inputting different numbers from the DIP switch. You may exit this interrupt handling routine by inputting a zero on all switches, which the IRQ DEMO interprets as a signal to return from interrupt (i.e., go back to the main program).

## Options and References

Port expansion to as many as 32 ports, 16 input and 16 output, is possible from one card slot. Figure 6 shows how to use the four address lines and the DEVICE SELECT line to do this. As shown, the "one of sixteen decoder," LS154, uses the R/W line to fix the lower eight of 16 lines as output of write lines (R/W = 0). The upper eight lines will be input or read lines, because R/W (the most significant bit) is 1 in this case.

With DS on one enable and A3 on the other, a value in the range of $C0N0 to $C0N7 is addressed. The A0–A2 bits address high/low pairs (0000 & 1000, 0001 & 1001, etc.), while the R/W line on the MSB separates these pairs into read or write lo-

```
 4  REM ::::::::::::::::::
 5  REM ::  ASCII ECHO   ::
 6  REM ::::::::::::::::::
 8  HOME : PRINT "PRESS ESC TO EXIT"
 10  GET IN$
 20 IN =  ASC (IN$)
 25  IF IN = 27 THEN  END : REM  "ESC"
 30  POKE 49344,IN: REM THIS IS $C0C0, WHICH IS OF THE FORM $C0NX, WHERE N=
      8+SLOT #.SLOT 4 IS USED HERE.
 40  GOTO 10
```

*Listing 1. Output Demo and Test program. "ASCII ECHO" simply outputs the extended (MSB on) ASCII code for any key pressed.*

```
 80  REM ::::::::::::::::
 81  REM .  RUNNING LEDS
 82  REM ::::::::::::::::
 85 D$ =  CHR$ (4)
 90  PRINT D$;"BLOAD IRQ DEMO 1/$300,A$300"
 95  CALL 768
 100 I = 1:FL = 1
 110  POKE 49344,I
 112 KY =  PEEK ( - 16384): POKE  - 16368,0: IF KY > 127 THEN FL =  - FL
 114  IF FL < 0 THEN 160
 120  GOSUB 300: REM  SPEED IT UP BY SUBSTITUTING CODE AT 300 IN PLACE OF T
      HE GOSUB.
 125 I = I * 2
 130  IF I > 128 THEN 100
 140  GOTO 110
 147  REM ::::
 148  REM ::::
 150 I = 128: REM  REVERSE DIRECTION.
 160  POKE 49344,I
 170 KY =  PEEK ( - 16384): POKE  - 16368,0: IF KY > 127 THEN FL =  - FL
 180  IF FL > 0 THEN 110
 190  GOSUB 300
 195 I = I / 2
 200  IF I < 1 THEN 150
 210  GOTO 160
 300  FOR D = 1 TO  PDL (1): NEXT D
 310 PU =  PDL (1): PRINT PU;"-";I,
 320  RETURN
```

*Listing 2a. Complete I/O and Interrupt Demo and Test program consists of a main program with running LEDs whose direction is reversed via a keypress and whose speed is varied with paddle 1. This main program can be interrupted by the momentary switch, which generates sound, the pitch of which is proportional to the value input on the DIP switch.*

```
0800            1  ;************************
0800            2  ;       IRQ DEMO 1
0800            3  ;        1/2/82
0800            4  ;************************
0800            5  PER     EPZ $06              ;PERIOD FROM PORT1
0800            6  PORT1   EQU $C0C0            ;RD & WR LOCS ARE ONE IN THE SAME.
0800            7  ;
0300            8          ORG $300
0300            9          OBJ $800
0300 A911      10  INIT    LDA #IRQSUB          ;SET IRQ VECTOR,LOBYTE
0302 8DFE03    11          STA $3FE
0305 A903      12          LDA /IRQSUB          ;HIBYTE
0307 8DFF03    13          STA $3FF
030A ADC0C0    14  IRQON   LDA PORT1            ;DISABLE IRQ LINE BY PRESETTING THE
030D            15  ;                            IRQ F/F BY A LOW DS-SIGNAL.
030D 58        16          CLI
030E 60        17          RTS
030F 78        18  IRQOFF  SEI
0310 60        19          RTS
0311 204CFF    20  IRQSUB  JSR $FF4C            ;MON SAV1, NOT SAVE!
0314 ADC0C0    21          LDA PORT1            ;DISABLE IRQ LINE & GET PERIOD.
0317 8506      22  SOUND   STA PER
0319 0901      23          ORA #$01             ;ECHO 7 MSB'S OF PERIOD,
031B 8DC0C0    24          STA PORT1            ;& TURN SPKR ON.
031E A506      25          LDA PER
0320 20A8FC    26          JSR $FCA8            ;MON WAIT.
0323 A506      27          LDA PER
0325 29FE      28          AND #$FE             ;PRESERVE 7 MSB' OF PERIOD,
0327 8DC0C0    29          STA PORT1            ;& TURN SPKR OFF.
032A ADC0C0    30          LDA PORT1            ;#$00 INPUT MEANS EXIT.
032D D0E8      31          BNE SOUND
032F 203FFF    32          JSR $FF3F            ;MON RESTORE.
0332 40        33          RTI
```

*Listing 2b. The IRQ Demo is the interrupt handler and tone generator that takes over upon system interrupt, initiated via the SPDT switch.*

cations, as just noted. The 16 lines are brought out and, along with the 01 clock, can be used as the respective enabling signals to the respective input and output port devices. The buffer board would, of course, be the logical choice for this address decoder.

Note that placing an inverter on the A3 enabling line allows you to access the other 16 locations, this time in the range of $C0N8–$C0NF, in a manner analogous to that just described.

One final point about your further progress:

This article can only serve as an introduction to interfacing and related matters. If you need a thorough grounding in digital electronics, or more detailed knowledge of advanced applications, or anything in between, use the included bibliography as a start.

To modify this circuit, try the 6520 or 6522 support devices. By all means obtain the 6500 series manuals from Synertek or Rockwell. Just as important are many data and applications manuals (TTL, linear and interface devices, CMOS, etc.). Call or write Texas Instruments, Fairchild, Motorola, Analog Devices, National Semiconductor, among others, getting their addresses from the periodical literature. Having a stock of data and applications manuals is a must in your learning process. Read the literature, experiment and have fun! The bibliography given is a guideline, but you can't go wrong by obtaining a few of the entries for study and reference. ■

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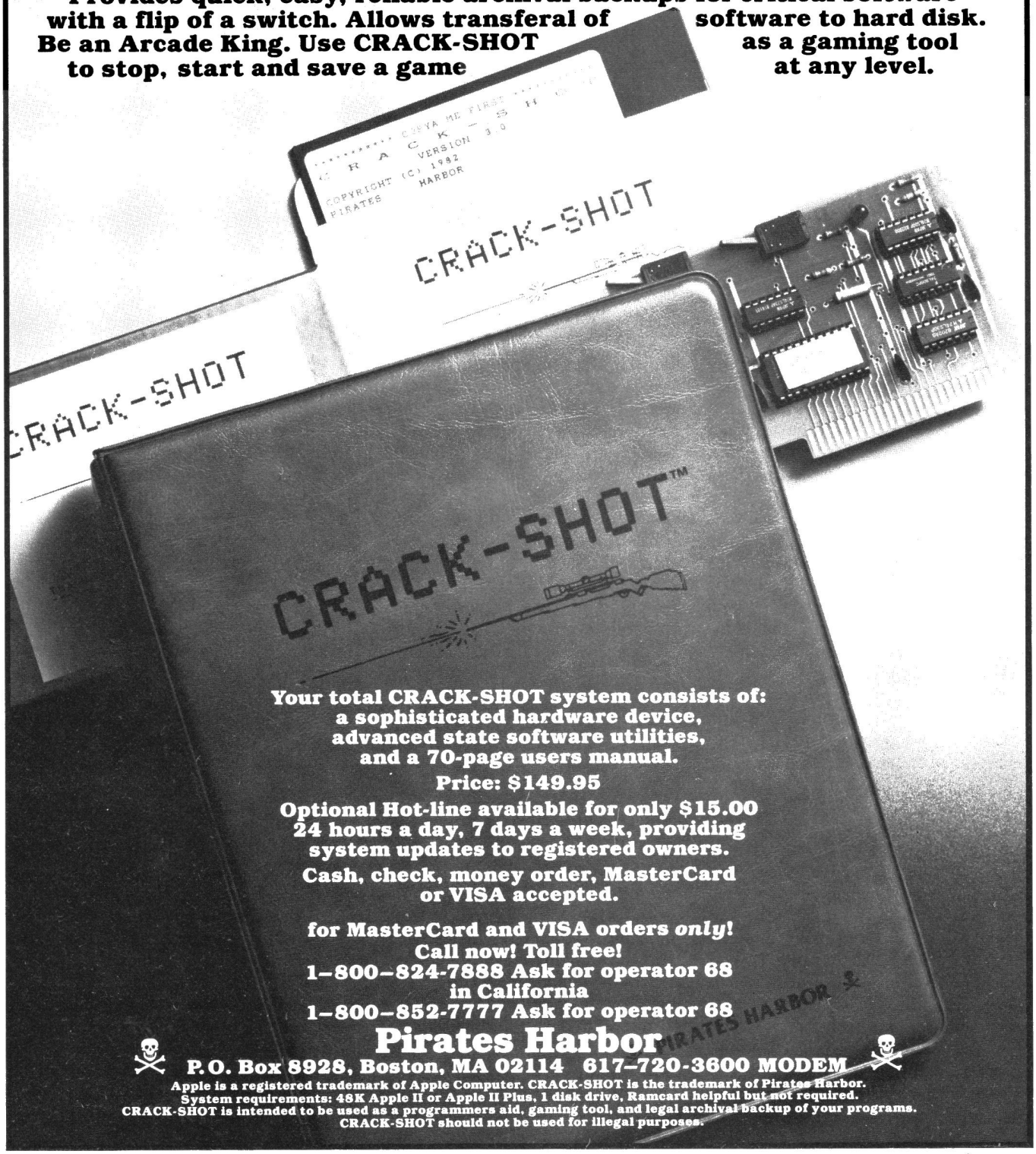


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# How I Found a New Career in Computing

**Life in the board room can be limited indeed. Share one man's saga of how computers changed his life.**

**by Paul Raymer**

I had been reading articles in many business publications—*Forbes*, *The Wall Street Journal*, *Baron's* and others—about the continuing impact of the small computer on the business environment and, in fact, on our daily personal lives.

As the Chairman of the Board of a large manufacturing company in the West, I felt that it was important that I know what was happening in the marketplace. . . and asked that our purchasing people obtain a personal computer for my examination and review.

The next day an Apple II was delivered to my office, complete with several disk drives, a color monitor, and a printer. I had been advised that all available extra devices had been installed in the unit and that it was ready to go.

The instruction manuals for the computer, one for each of several extra devices installed in the machine and an assortment of general information books on "How to Learn Basic," "Make Money in Your Spare Time by Programming," "Assembly Lines" and "Bert Kersey—the Man and His Computer," filled my desk.

I devoted as many hours as I was able to steal away from corporate work to teach myself programming. I found it best to merely get the instruction manual, attempt a step and then—if successful—go on to the next chapter. Basic was relatively simple for me to learn since I was proficient in Latin, calculus and invertebrate zoology, and had learned to type without looking at the keyboard, except for the numbers, of course.

In addition, I found that I was able to get a great deal of help from local dealers. They could not explain how an array works, or what the various Hi-Res graphics commands performed, but they were willing to sell me computer magazines, supplies, accessories and lots of new programs.

Once I learned that HOME and CALL −936 were practically the same thing, I knew I was on my way to mastering the machine.

Several times I had specific problems that I felt could easily be answered by the manufacturer of the computer, and I had my secretary write to the Apple people in California. I received no reply, and found out later through our research department that management at Apple had given instructions some time ago to remove all typewriters from their offices. Apparently, this is why I never heard from them.

It was not very long before I was able to use the Apple Tool Kit and the leading spreadsheet program. It has been my custom, when an item has a TM after it *every time* you see it in print, to merely avoid using that name in documents of any kind. This is what I have been advised by our legal people.

Our annual stockholder's meeting seemed the perfect place to try out the program I had developed with the spreadsheet and the Tool Kit.

The grand ballroom at the hotel was crowded with stockholders, all waiting to cast their ballots for the next year of leadership of our company. My program was going to show the progress of our corporation, the projected sales for the next decade, the growth of product, the increased percentage of profit and why we had done so well in the last three quarters.

My Apple was connected via network to two dozen 25-inch color monitors strategically located throughout the room, and a large projection screen was set up behind the podium.

Apparently some minor flaw in programming resulted since the entire spreadsheet was labeled in Katakana.

The presentation was not a success.

Joshua Andrews became the new Chairman of the Board. I became vice-president of finance.

I realized that I needed more work on my Apple, and so purchased several more programs that I felt would better serve my needs.

*Paul Raymer is now associated with Paul's Electric Computer, Box 42813, Las Vegas, NV 89116.*

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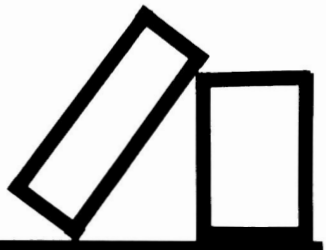

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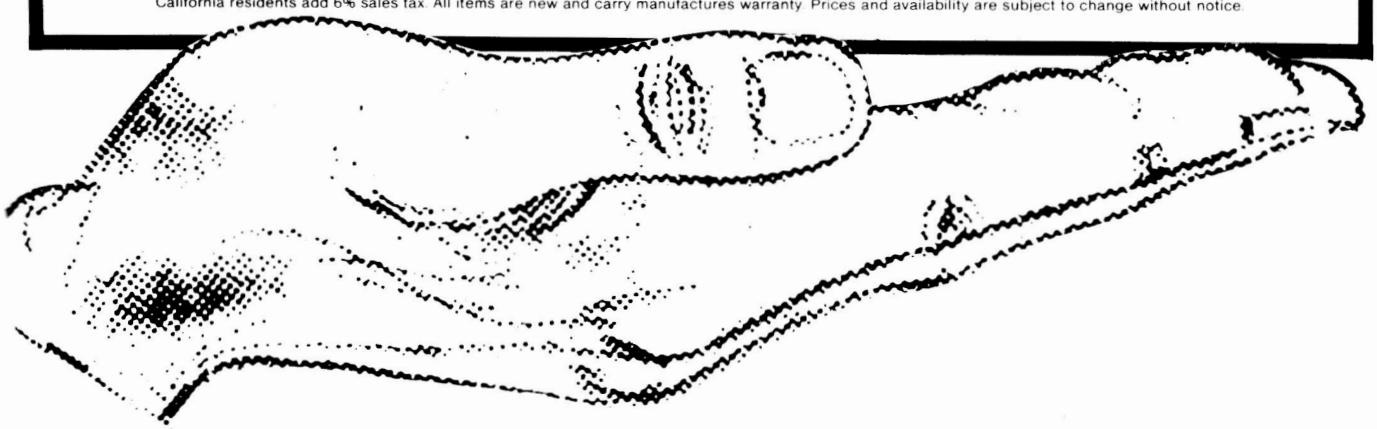

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**"...suddenly the bar charts started moving back and forth across the screen."**

The purchase of the Home Accountant seemed mandatory, since I wanted to prepare reports of a financial nature and, knowing that three authors had worked together in its preparation, I was sure it would work for me.

Then I bought the Graphics Magician to enable me to better understand high-resolution graphics.

Use of the Home Accountant was quite easy to learn, particularly since I had taken a summer course at Harvard Business School, had a crash course in economics when my wife asked me to find the missing $6080 in our checkbook, and owned a calculator manufactured in the U.S.A.

The use of the Graphics Magician was another story. Although it wasn't too important that I master animation or high-resolution graphics, it was fun running the demo programs. The instructions were rather complex, and two Phi Beta Kappas quit our employ when I showed them the instruction manual. They had assumed I wanted it translated into one of the Romance languages. Incorrect, merely English.

Our first quarter financial report was due and now I had a chance to display some of the skill I had perfected. As a final touch, I purchased the Apple Plot program to better demonstrate the financial status of our corporation in graphic terms. The use of the Apple Plot and the Graphics Magician was sure to attract attention at the board meeting when I submitted our financial report.

The report started out remarkably well. The other officers of the company were pleasantly surprised at the figures and relationships of debits to credits, and everything was proceeding in the most expedient manner when suddenly the bar charts started moving back and forth rapidly across the screen.

The chaos that ensued only subsided when one of the junior account executives (who was passing by in the hallway) took control of the joystick and was able to get the *Gross Sales* to devour all the *Entertainment Expenses, Employee Benefits* and *Travel Expenses.* Only because of that young man's experience with Dan Tobias' Calc-Man was he able to control the situation so efficiently and expertly.

The young man, Gary Stephens, became our corporation's new vice-president of finance. I was transferred to Administration and became the new office manager.

It was then I realized that more time would have to be spent at my Apple to improve my technique and understanding of the fine points of programming, computer care and understanding Basic, hex and new things such as Pilot, Logo and how to fix the coffee machine.

At this time I realized that I needed to return to basics to truly learn the Apple from the ground up, and so instead of purchasing one of those high-powered database management systems I saw advertised, I decided to use


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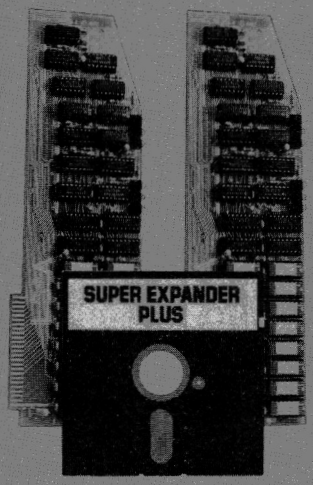


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**"And I was allowed to take the free wall charts that Bert Kersey gave me."**

the File Cabinet. I had obtained an unprotected copy from a local retailer for $2.98 and copied it with Sensible Software's Back It Up. It is a great utility and I was able to make a copy after only four attempts!

Then I purchased the Beagle Bros. DOS Boss to learn how my DOS worked. To show you how naive I had been, I didn't even *know* I had DOS in my computer until I started using that disk!

It was a profound experience, and I knew my whole career was going to turn around soon—I had learned to remove the volume numbers from my disks. Just think, no more VOL 254s on *my* disks!

I worked diligently for several months, and after that time—without the help of any of the office staff (well, with the possible exception of one of the women in the steno pool)—I was able to put our entire international sales records into the File Cabinet. I entered every branch in the 87 countries in which we had offices, gross sales for each month, a list of all personnel, and the phone numbers of people to contact in case of emergency.

All of this information was put on a single 16-sector disk. I didn't know it was 16-sector; I thought it was a Dysan disk, but the Beagle Bros. taught me all that. The disk had *no* volume number on it, of course.

Miss Jennifer Christine came in to supervise my report. I had also asked that the vice-president of Administration attend my special presentation. Ms. Stephanie Anne honored me by attending.

I then put my report disk into the drive, turned the Apple on and waited for the File Cabinet to sort the information.

My dismissal may be credited to the fact that a work day is only eight hours at my (former) corporation. It may be that the File Cabinet is still sorting; I'll never know. They made me leave the Apple there still working and I was asked to exit the building promptly.

They were very nice about it, however, and allowed me to keep the little stickers that come with new disks. Both sizes. And I was allowed to take the free wall charts that Bert Kersey gave me.

I was hooked on computing, of course, and so decided to get closer to the industry.

I am now working as the national product distribution officer for a small software development firm. The chief programmer is married to my sister Penny and he calls my position "shipping clerk," but I have never put too much stock in titles.

Recently I acquired the Super-Text word processing system and am learning the ins and outs of how it works. Page one is tough, though; it says something about "booting" a disk. If I ever get past that part of it I am sure that word processing will be a snap.

It's *wonderful* to start life again, with my new career in computing! ■


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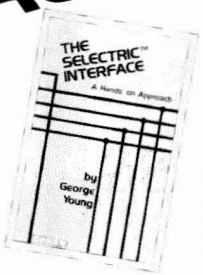


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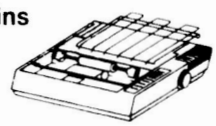

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by Lee E. Sumner, Jr.

# Two Keys to Success

The Sumner Apple Programmers and LINGuists (SAPLING) Society was experiencing an internal rift. Apple user number 1 (age 8) was dissatisfied with the typing speed of user number 2 (age 5). Number 2 wanted to "do it myself," but typing in RUN FRANKENSTEIN was taxing user 1's patience. As self-appointed head of SAPLING, I knew that a serious threat to the usually harmonious and quiet (ho-ho!) atmosphere of our household was developing.

### The Key to Harmony

A solution to the problem—a menu program for selecting a program on disk with one keystroke—was located in a back issue of *Call-A.P.P.L.E.* Finding and typing F would be a lot less frustrating for 5-year-old fingers than typing RUN FRANKENSTEIN.

In keying in the program and trying it out I found one shortcoming. Each disk needed a unique menu program, because the names of the files were kept in the menu program itself. As the files kept on each disk were different, the menu program would have to be different.

I decided to rewrite the menu program using a text file to hold the program names. This way the menu program could be the same on each disk. I also wrote an editor program to create the text file.

Included in the revision was the addition of a few lines to the Hello program to provide a choice between the menu, cataloging the disk or defaulting to command mode. Now when one of the SAPLING users starts up the Apple, she presses 1 to select the menu from the Hello program, and then presses the letter corresponding to the desired program. Thus, running the program takes only two keystrokes. (Of course, the menu program could be the Hello program and only one keystroke would be needed.) All the SAPLING users know that if they want to run another program they press reset and type RUN MENU.

The programs presented here are flexible enough to run, load or BLoad any program that I have used. If several files are necessary, I write a loader and runner program to do the necessary housekeeping.

The SAPLING menu system consists of three files. First is the menu program itself. Next is the text file containing the menu data. Third is the program that edits the menu and creates the text file. It is not necessary to have the menu editor, Menu Text Create, on all disks, since you use it only to create or change the menu.

To use the system, type in Menu and Menu Text Create, and save them on the same disk. Then run Menu Text Create.

```
********SAMPLE TITLE

A ---------------------- N ----------------------
B ---------------------- O ----------------------
C ---------------------- P ----------------------
D ---------------------- Q ----------------------
E ---------------------- R ----------------------
F ---------------------- S ----------------------
G ---------------------- T ----------------------
H ---------------------- U ----------------------
I ---------------------- V ----------------------
J ---------------------- W ----------------------
K ---------------------- X ----------------------
L ---------------------- Y ----------------------
M ---------------------- Z ----------------------

PRESS (0)->TEXT OK—SAVE AND EXIT
      (1)->CHANGE TITLE
      (2)->CATALOG
      (A-Z)->CHANGE FILE NAME
```

*Figure 1. Pre-edit screen dump of Menu Text Create.*

### The Editor

The first time you use the system, the menu data will not exist. The program will ask you if the text file exists. Answer NO. A dummy file will then be created, consisting of a sample title and strings of hyphens for file names. There is room for 26 file names in the menu, one for each letter of the alphabet.

Now the menu will appear with the sample title and dummy names (see Figure 1). The options are:

| | |
|---|---|
| 0 | Text OK, save and exit |
| 1 | Change the title |
| 2 | Catalog the disk |
| A–Z | Change a file name |

Zero is the key you press last, when you are finished editing the menu. You can press the keys 1, 2 and A–Z in any order. Pressing 1 allows you to rewrite up to two lines of title information. The program is not smart enough to center the titles, so you must do a little juggling to get it to look right. Try a few to get the hang of it.

Pressing 2 catalogs the disk in the drive. This feature allows you to go back and check any forgotten files and spelling. Then press return to get back to the main display.

Pressing any letter key will let you type in a file name for that location in the menu display. To specify the DOS command to load the file add one of the following suffixes to each file name:

| | |
|---|---|
| To Run a file | no suffix |
| To BLoad a file | .L |
| To BRun a file | .B |

*Address correspondence to Lee E. Sumner, Jr., 75 E. King St., Dallastown, PA 17313.*

```
100  HOME : TEXT : VTAB 2: HTAB 5: PRINT "## CATALOG MENU TEXT CREATE ##
110 D$ =  CHR$ (13) +  CHR$ (4):M$ = "MENU TEXT":OP$ = D$ + "OPEN" + M$:CL
    $ = D$ + "CLOSE" + M$
120 T$ = "########       SAMPLE TITLE                "
130  DIM F$(26): FOR X = 1 TO 26:F$(X) = "--------------------": NEXT X
140  REM  ### GET OLD MENU TEXT ###
150  VTAB 10: PRINT "DOES MENU TEXT ALREADY EXIST (Y/N)? ";: GET A$
160  IF A$ = "Y" THEN  GOSUB 400
170  REM  ### DISPLAY MENU ###
180  HOME : VTAB 2: INVERSE : PRINT T$: NORMAL : PRINT
190  FOR I = 1 TO 13: INVERSE : PRINT  CHR$ (I + 64);: NORMAL : PRINT " " LEFT
    (F$(I),17);: HTAB 21: INVERSE : PRINT  CHR$ (I + 77);: NORMAL : PRINT
    " " LEFT$ (F$(I + 13),17): NEXT
200  GOSUB 300
210  PRINT "PRESS (0) -> TEXT OK-SAVE AND EXIT": HTAB 7: PRINT "(1) -> CHA
    NGE TITLE": HTAB 7: PRINT "(2) -> CATALOG": HTAB 5: PRINT "(A-Z) -> C
    HANGE FILE NAME"
220  GET A$: GOSUB 300
230  IF A$ = "0" THEN 600
240  IF A$ = "1" THEN 500
250  IF A$ = "2" THEN 700
260  PRINT "INPUT FILE NAME FOR POSITION ";A$
270  INPUT F$( ASC (A$) - 64)
280  GOTO 180
300  VTAB 20: HTAB 1: CALL  - 958: RETURN
399  REM  ## READ THE TEXT FILE ##
400  PRINT OP$
410  PRINT D$;"READ";M$
420  INPUT T$
430  FOR X = 1 TO 26
440  INPUT F$(X)
450  NEXT X
460  PRINT CL$
470  RETURN
499  REM  ## GET NEW TITLE ##
500  PRINT "INPUT TITLE. FIRST CHARACTER CANNOT BE": PRINT "A SPACE.  UP T
    O TWO LINES CAN BE": PRINT "ENTERED."
510  INPUT T$
520  GOTO 180
599  REM  ## WRITE A NEW TEXT FILE ##
600  PRINT OP$
610  PRINT D$;"DELETE";M$
620  PRINT OP$
630  PRINT D$;"WRITE";M$
640  PRINT T$
650  FOR X = 1 TO 26: PRINT F$(X): NEXT X
660  PRINT CL$
670  HOME : END
699  REM  ### SHOW CATALOG ###
700  PRINT D$;"CATALOG"
710  PRINT : PRINT "PRESS RETURN TO CONTINUE-->";
720  GET A$: GOTO 180
1000  REM
```

*Listing 1. The Editor—Menu Text Create.*

```
100  DIM F$(26):M$ = "MENU TEXT":D$ =  CHR$ (13) +  CHR$ (4): HOME
110  PRINT D$;"OPEN";M$
120  PRINT D$;"READ";M$
130  INPUT T$
140  FOR X = 1 TO 26
150  INPUT F$(X)
160  NEXT
170  PRINT D$;"CLOSE";M$
180  VTAB 2: INVERSE : PRINT T$: NORMAL : PRINT
190  FOR I = 1 TO 13: INVERSE : PRINT  CHR$ (I + 64);: NORMAL : PRINT " " LEFT
    (F$(I),17);: HTAB 21: INVERSE : PRINT  CHR$ (I + 77);: NORMAL : PRINT
    " " LEFT$ (F$(I + 13),17): NEXT
200  VTAB 21: HTAB 12: PRINT "SELECT BY LETTER:";: GET L$:KEY =  ASC (L$) -
    64
210 FILE$ = F$(KEY)
220  HOME : VTAB 10: HTAB 10: PRINT "LOADING "FILE$
230  IF  MID$ (FILE$, LEN (FILE$) - 1,1) = "." AND  RIGHT$ (FILE$,1) = "L"
     THEN FILE$ =  LEFT$ (FILE$, LEN (FILE$) - 2): PRINT D$"BLOAD"FILE$: HOME
    : GOTO 180
240  IF  MID$ (FILE$, LEN (FILE$) - 1,1) = "." THEN FILE$ =  LEFT$ (FILE$,
     LEN (FILE$) - 2): PRINT D$"BRUN"FILE$: END
250  PRINT D$"RUN"FILE$: END
1000  REM
```

*Listing 2. The Menu program.*

As an example, to run a Basic program, type in the file name as usual. To BLoad a file called Serial Driver.Obj type in SERIAL DRIVER .OBJ.L. To BRun the same file type in SERIAL DRIVER.OBJ.B. The menu program ignores the last two characters of a file name with the next to last character a period. You do not have to change any names on the disk unless you use this convention for some other reason.

When you finish typing in all the files you want in the menu, press 0 and the text file will be saved. Now you can run Menu to display the files on that disk. Press the letter beside the file desired and that file will be processed according to the suffix. Note that if the command is to BLoad, the menu returns to the display for more selections. If you wish to exit the menu, press control-C and return.

It may seem at first glance that only file names 17 characters long and shorter can be used. Not so. To get as much on the screen as possible, Menu only displays the first 17 characters of the file name. The full name length allowed by DOS, not including the suffix, can be used. So, if you tend to be long-winded in naming your files, this menu system won't slow you down.

### The Listing

No programming article is complete without a blow-by-blow description of the programs. You will not be spared this time either. Let's look at Menu Text Create shown in Listing 1.

The program starts in line 100 by clearing the screen and displaying a title. Lines 110 and 120 set up some string variables, including T$, the title used in the menu display. Line 130 dimensions a string array to hold the 26 file names and fills them with strings of hyphens.

Line 150 asks if the text file already exists. Should the answer be yes, line 160 uses the subroutine at 400 to load the text file. Line 180 clears the screen and displays the title, 190 prints the 26 file names, with the key letters shown in inverse mode, and 200 calls the subroutine at 300 to clear the bottom of the screen.

Line 210 prints out the menu of commands, followed by 220 getting the chosen command and clearing the bottom of the screen. Lines 230, 240 and 250 direct the program to the appropriate routine. Line 260 prompts for a file name, and 270 places it in the F$ array in the position corresponding to the chosen key letter. Control is then passed to line 180 to display the changes and prompt for the next input.

Line 300 is a subroutine to position the cursor at line 20 on the first

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**"If I have caused any intellectual gears to grind, I feel I have accomplished something..."**

position and clear to the end of the screen.

Lines 400–470 comprise a subroutine to read the text file containing the menu title and 26 file names.

Lines 500 and 510 are the statements that input the desired menu title. Then control is returned to the beginning of the input sequence.

Lines 600–670 write the edited title and file names to a text file on disk, clear the screen and exit the program.

Lines 700–720 are the statements displaying the catalog of the disk in the drive, with a pause to give you a chance to read the screen. Any key will send the program back for the next command.

### The Menu Program

Now let's look at the Menu program in Listing 2. The program begins by dimensioning the file name array, setting up some variables and clearing the screen in line 100. Lines 110–170 load the menu text file.

Line 180 prints the title, then 190 displays the menu body using the file names from the text file. Line 200 prompts for a key input, gets it and converts the keystroke into an index for the MENU$ array of file names. Line 210 sets FILE$ to the desired file name to be loaded, and immediately line 220 shows you what's going on by displaying the chosen name.

Lines 230–250 do some string manipulation to determine if the file should be run, BLoaded or BRun. If it is BLoaded, the program clears the screen and returns to line 180 to ask for another file.

### The Hello Program

As mentioned, I modified my Hello programs on some of the disks to give me a choice of Menu, Catalog, or Command mode. The statements in Listing 3 will give you some ideas on how to incorporate this feature into your own Hello program.

Line 1120 prints a menu of options: 1 to run Menu, 2 to catalog the disk and 3 to go to command mode. Line 1130 gets your response and checks for an out-of-range entry.

Then line 1140 uses this response in a computed Goto statement to select the proper command.

Of course, as suggested parenthetically earlier, you do not have to use this approach. Menu could be renamed Hello and it would run whenever the disk is booted.

I know many of you will have different ideas on implementing this system. Perhaps you have changes in mind already. If I have caused any intellectual gears to grind, I feel I have accomplished something, even if no one uses the programs I have presented here. Trying to do things better than the other fellow is what keeps the skill level of programming on the increase. However, I also heed the sage advice, "If it works, don't fix it."

Anyway, my SAPLINGs can use this system with speed and little frustration, and my skill as a mediator is corroborated. ■

```
1120  PRINT : PRINT "PRESS 1 FOR MENU": HTAB 7: PRINT "2 FOR CATALOG": HTAB
    7: PRINT "3 FOR COMMAND MODE"
1130  GET X: IF X < 1 OR X > 3 THEN 1130
1140  ON X GOTO 1150,1160,1170
1150  PRINT  CHR$ (13) +  CHR$ (4);"RUN MENU": END
1160  PRINT  CHR$ (13) +  CHR$ (4);"CATALOG": END
1170  END
```

*Listing 3. Hello program modification.*

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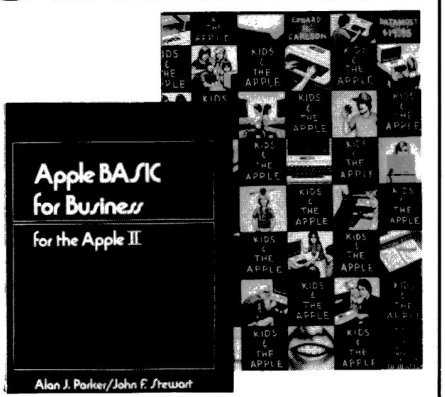


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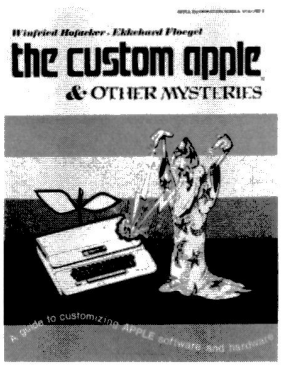


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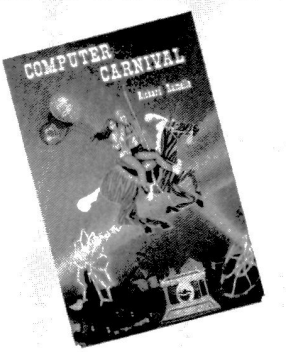


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SAVVY

# Bent on Business

by Gregory R. Glau

**The businessman-turned programmer... an ideal situation?**

# Murphy As Programmer

Everyone knows Murphy's most famous law: If Anything Can Go Wrong, It Will Go Wrong. What people don't know is that Murphy was a small-business man who liked to do his own computer programming....

Now this Murphy thought he was a pretty sharp programmer. He knew a bit of Basic, understood how his business ran, and a little about double-entry accounting, and so he figured it would be a snap (as he told his bookkeeper one day) "...to whip up a little Accounts Receivable program...."

Now Murphy wasn't dumb by any means, and figured if he could copy his "paper and pencil" A/R system on his Apple, he'd be in pretty good shape.

And really, to mimic an existing manual system isn't a bad idea for the businessman-turned-programmer. After all, he knows how his manual system works, so he should be able to translate this into an Apple program.

Murphy knew enough to do a creditable job, and his basic concept for the A/R system was sound, so perhaps it was just Murphy's Law that caused him double trouble.

To start, Murphy created two "sides" to his Accounts Receivable program. One was a "ledger card" for each customer, showing all the charges and credits, all the transactions for a month's worth of business. It looked like Figure 1.

```
MR. AND MRS. ROBERT F. PORTER     ACCT # 144
127 SOUTH MT VERNON AVENUE
CAMBRIDGE  MA 02117
-----------------------------------------
BALANCE FORWARD.....................$ 0.00
-----------------------------------------
#    DATE     INVOICE    AMOUNT    BALANCE
-----------------------------------------
1. 04-02-83   15526      47.50      47.50
2. 04-15-83   17728     -20.00      27.50
3. 04-16-83   17782      21.00      48.50
4. 05-11-83   17899     -20.00      28.50
5. 05-13-83   18828     -20.00       8.50
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
ANSWER 0 TO EXIT, OR THE LINE # TO POST TO-->
```

*Figure 1. Sample "ledger card."*

You'll note that all 24 lines available on the Apple screen were used, so Murphy could only have 15 entries in any single account. In his business, that was enough; another type of business might require more than one page of information for each customer.

Then he set up the distribution side of the ledger, with accounts (just like the ones on the customer's side) for material, labor, sales tax, contracts, permits, freight and so on.

Now while no single customer would have more than 15 transactions during any given month, Murphy will obviously sell more labor, materials, and so on than 15 entries' worth. So, on the distribution side of the ledger he had a number of labor accounts, a number of material accounts, a number of sales tax accounts, and so on. His summary program would take care of adding them up properly to give him totals for the various categories.

The idea is, of course, to post to one side of the ledger, the customer side, and then to duplicate the total amount posted on the other side of the ledger, and in that way to see that all accounts balance.

And that's one main idea behind double-entry bookkeeping: to simply make sure that things balance. When you take in $29 in cash, you record that, but you also must record that $29 on the other side of the ledger—so that one side *balances* out against the other.

Otherwise, an employee could collect that $29, put it in his pocket, and without the double-entry operation you would have no way to discover his theft.

*Address correspondence to Gregory R. Glau, PO Box 1627, Prescott, AZ 86302.*

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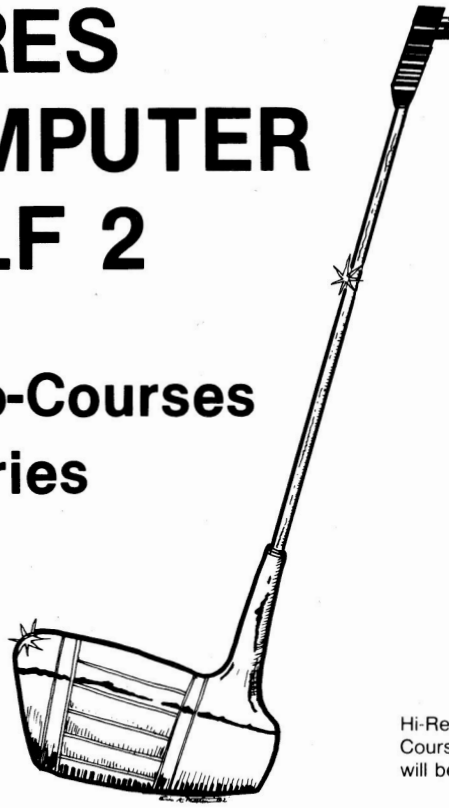

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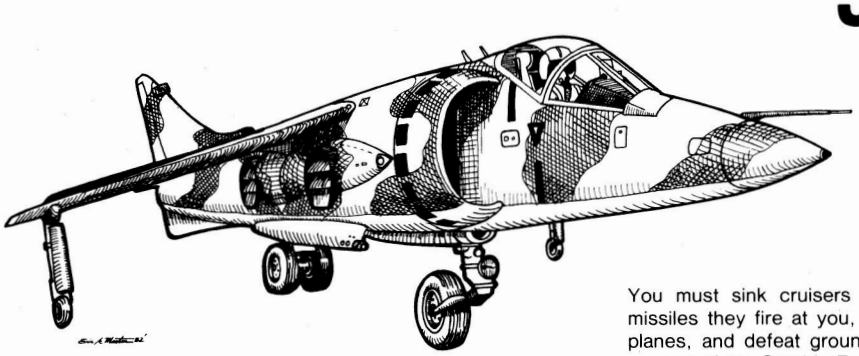

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*Figure 2. Sample sales card.*

Double-entry accounting also lets you *distribute* your income. Rather than just knowing your business sold $4230 worth of stuff, those dollars would be distributed among, say, labor, materials, equipment rent, sales tax, and so on.

And, after all, it's pretty obvious what gives you more information:

(1) total sales ..... $4,230

or

(2) material sales ..... $1,200
labor sales ..... 970
sales tax ..... 60
contracts ..... 2,000
total sales ..... $4,230

Now, Murphy also figured—and rightly so because of the peculiarities of the way Applesoft adds certain figures—that the easiest way to balance things in his double-entry system was to have positive figures on one side of the ledger, and negative figures on the other side.

Thus, if all he sold was material, labor and sales tax, his sales journal would look like Figure 2.

So, one side (the total sales side) balances the other (the distribution side), and the businessman knows exactly what he's sold. If something was out of balance, a mistake was made that would have to be corrected.

The double-entry method of accounting simply puts all customer transactions on one side of a ledger (or piece of paper), and all information about those transactions, from the *business* point of view, on the other side of the paper.

That's what Murphy did: set up his customer accounts on one side of the ledger, and his distribution accounts on the other side of the ledger.

When a sale of $56.00 was posted as a charge to a customer, the same amount was distributed as minus figures on the opposite side of the ledger. When a customer paid his bill, his account would be credited (with a minus figure), and then the payment amount would be debited on the other side of the ledger (as a positive figure) to a cash received account.

For example, when cash was received as a payment for that $56.00 charge, the customer's account would be credited the $56, ( - 56.00) and the same amount would be put into an account on the other side of the ledger (called cash received) as a positive figure (56.00). Thus, for both *charge sales* and cash receipts, one side of the ledger balances out against the other side; when you add one side to the other, they should total zero.

Now, just to make sure, Murphy wrote a section of his A/R program to check that his postings did in fact balance. Basically, what this part of the program did was to add up all of the amounts from the customer side of the ledger, and add all the amounts from the distribution side of the ledger, and check if the combined total was zero. If not, it would indicate the amount "out of balance."

Finally, Murphy figured he was finished, and proudly turned over the A/R program to his bookkeeper, who started entering accounts and amounts and charges and credits.

The thing worked o.k. too, until, after she'd made about 200 entries, the bookkeeper thought she'd better see if her postings did in fact balance—so she ran that part of the program only to discover she was out of balance by 32 cents.

Murphy said, "Wonderful."

Well, he'd planned for this, and had a part of his program that gave them a printed copy of all transactions. That way, they could compare each entry from one side of the ledger to the postings on the other side, and so determine which did not match up.

The only problem was, that after almost every batch of postings, the bookkeeper was out of balance. It seemed like they were continually printing out everything and searching through it. Eventually they'd find where she'd transposed a number, or whatever—but the whole process was taking longer than their old manual system!

After about two months of this interesting procedure, Murphy figured there *had* to be a better way to handle his "out of balance" problem.

What could he do? What would you do?

The answer he found is to check each posting as it's entered, rather than to wait until you've posted a couple of hundred figures and then check them for accuracy.

Remember, now, that Murphy's system entered one thing—a customer's charge or a credit—on one side of the ledger, and then distributed that amount on the other side of the ledger, to material, labor, and so on—whatever the sale consisted of. In other words, one posting—the first one—should equal all the rest of the postings for that transaction.

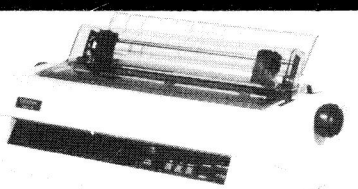
If you bought $47.50 worth of things from Murphy, he would charge your account $47.50. Then, the same amount would be distributed on the other side of the ledger as minus figures (perhaps $13.00 for materials, $34.00 for labor and $.50 for sales tax). These three—labor, materials and sales tax—should equal the amount that was charged to your account.

What Murphy did was to create a little subroutine to check each transaction *as it was entered.*

Here's how he did it.

After posting the first entry, on the customer side of the ledger, he made the variable C equal to this amount.

# All for Apple ...



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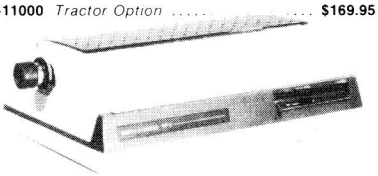

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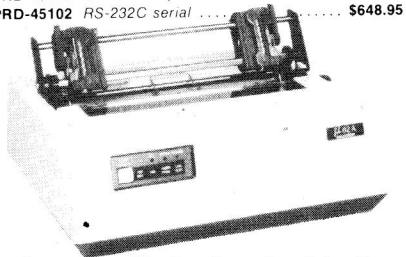

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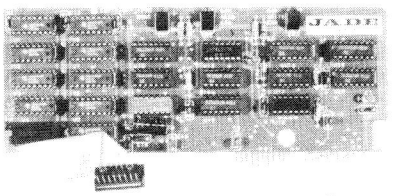

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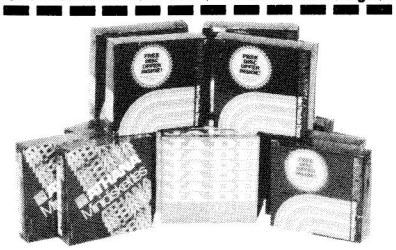

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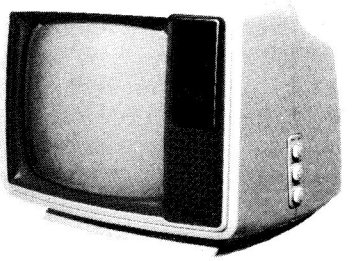

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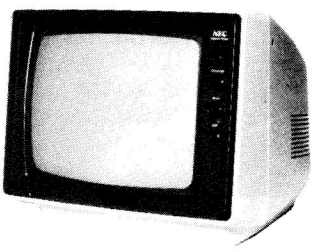

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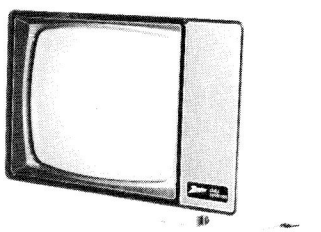

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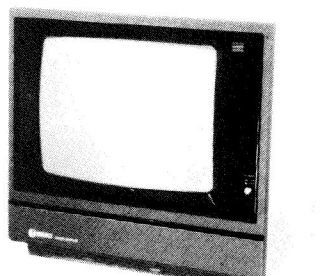

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For instance, in this particular system, the posting to the customer's ledger card is input as the variable A (for amount). So, after the amount has been posted to the customer's ledger card, Murphy put this line into his program:

```
4000  C = A
```

This made C equal to the amount of the posting. He used C to mean the Customer side of the ledger.

Then, on the other side of the ledger, as the total was distributed among labor, sales tax, resale, and so on, another variable was assigned to each of those postings. B(1) was made to equal the first posting on the other side of the ledger, B(2) was set to equal the next, and so on. B was used to indicate the Business distribution side of the ledger.

For example, if you bought that $47.50 worth of things from Murphy, you would be charged $47.50. C would equal 47.50.

Now, as Murphy's bookkeeper posted the amount to labor (−34.00), the program had a line that made B(1) = −34.00. When she posted the material amount (−13.00), the program made B(2) = −13.00. And, when she posted the sales tax (−.50), the program made B(3) = −.50.

The B postings run from B(1) through B(9), which means Murphy could distribute 9 entries on the Business side of the ledger. This was enough for his business.

Once the bookkeeper indicated this particular transaction had been posted completely, the program went through this subroutine:

```
11510  T = C + B(1) + B(2) + B(3) +
       B(4) + B(5) + B(6) + B(7) +
       B(8) + B(9)
11515  REM T SHOULD EQUAL ZERO
```

If the postings zero out, then this subroutine would return the program to where it branched out to check its figures:

```
11520 IF T = 0 THEN RETURN: REM
-THIS TRANSACTION BALANCES
```

If the figures do *not* zero out, then one side of the ledger doesn't balance against the other, and so the program informs the operator:

```
11530  HOME: FLASH: PRINT "THESE
       POSTINGS DO NOT BALANCE."
       :NORMAL
11540  PRINT
11550  PRINT "HERE IS THE INITIAL
       POSTING: ";C
11560  PRINT "HERE ARE THE OTHER
       POSTINGS:"
11570  PRINT B(1)
11575  PRINT B(2)
11580  PRINT B(3)
11585  PRINT B(4)
11590  PRINT B(5)
11595  PRINT B(6)
11600  PRINT B(7)
11605  PRINT B(8)
11610  PRINT B(9)
11620  PRINT "THE TOTAL SHOULD
       BE ZERO,"
11630  PRINT "BUT IT ACTUALLY IS
       ";T
11640  PRINT "THAT'S THE AMOUNT
       YOU ARE OFF"
11620  FLASH: PRINT "ANSWER 1 TO
       START OVER": NORMAL
11620  INPUT Q: RETURN
```

If an error was made, Murphy's bookkeeper knew it immediately, right after she'd done the posting. And not after she'd entered two or three hundred amounts!

The concept is that every number entered, every transaction posted, every sale completed must be checked against its component parts to make sure the entire thing balances.

By the way, after the return, all these variables must be zeroed out, so that you can start fresh with your next posting. You'd want a routine like this:

```
8000  C = 0
8010  FOR X = 1 TO 9
8020  B(X) = 0
8030  NEXT X
```

This effectively makes all of Murphy's check figures zero, and ready to be posted to once again.

Unfortunately, once Murphy fixed this problem, his A/R program *still* didn't always balance!

Murphy said, "Wonderful."

Take another look at Figure 1, Murphy's ledger card. See any problem?

When Murphy first designed and set up his ledger cards for his customers (or, for that matter, for the items on the other side of the ledger), he needed some way inside the program to tell his Apple which line on the ledger card he wanted to post to—where he wanted to write the information.

When the Porters pay off the last $8.50 they owe Murphy, he'd normally enter their payment on line 6—it's the next available place to enter an amount.

But how should Murphy decide which line to post on next?

There are two ways to approach this. One is to let the computer determine which line to post to, and the other is to let the operator tell the Apple which line they want to put the information on.

Which is best?

Well, if you let the computer select the line, it could be told to automatically go to the next blank line. But, what if you made an error during entry? What if you posted an incorrect amount or invoice number? To correct it, you'd have to reverse the entry on the next line. This, in turn, would throw your error-checking routine out of whack (B(1), B(2), and so on)...and if you made a second mistake in entering something... well, you get the idea: It could really be a problem.

To simplify this, Murphy decided to let the operator tell the Apple what line to use next. In posting, the ledger card appears on the screen, and the line on the bottom lets the operator select the entry # she wished to post to.

No problem—except that every so often, Murphy's bookkeeper would select a line to enter information on that *already had data on it*, and so she'd literally write over the existing information.

Wow!

After some thought, Murphy discovered an easy way around this problem. He simply wrote a line into his program that examines the line the operator wants to post to, and if there's already information in that line, it so informs the operator.

There still can be a manual override—the operator can still post to that line if she wants to—but at least she'll be aware that old information is being replaced with new data.

For instance, if you use L as the variable for the invoice number on your ledger card, you want a little routine in your program to see if anything exists on a line as this variable. If L is *anything*, that means it's an invoice number, and there's already something posted on this particular line of your ledger card:

```
15000 IF L >0 THEN 15100
15010 RETURN
```

Line 15000 checks to see if L is greater than zero. If it is, then it has to be an invoice number, and so something is posted on this line. The check is compared against the invoice number rather than the *amount* because an amount could be a negative figure, whereas an invoice number is always positive, and so can be quickly compared to zero.

So the program branches to line 15100 if L is greater than zero:

```
15100 REM THERE IS SOMETHING
      ALREADY POSTED HERE.
15110 HOME: FLASH
15120 PRINT "THERE IS ALREADY A
      POSTING HERE.": NORMAL
15130 PRINT: PRINT
15140 PRINT "ANSWER 1 TO POST
      HERE,"
15150 PRINT "OR 2 TO START OVER."
15160 PRINT: INPUT Q
```

From here, the program instructions let the operator carry out what he wants to do—either go ahead and cover up the existing posting, or start over and see the entire ledger card again. This gives the data-entry person a chance to back out once he's selected a line to post on, too. An exit-from-an-error, so to speak.

Once Murphy figured out that now and again his bookkeeper accidentally posted over an existing data line, he simply added the little subroutine to inform her what was happening.

This, coupled with the subroutine that checks every posting as it's made, solved Murphy's problems.

While these two little programming hints might seem simple (and they are, once you recognize the problems and figure out how to correct them), they're just the type of unusual problems that trip up even good programmers. Often we can get the big things done, the general concepts translated into code, the correct data saved in the right places, and so on, but one of these darn little problems hides in a corner somewhere, only to come out and cause trouble just when we think the program is perfect. Murphy's Law?

By the way, once these changes were made, our books, er . . . I mean Murphy's books, have been in balance ever since! ■


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**by Bill O'Brien**

# Freedom for Captured Files

As I promised last time, this month's article presents a program intended to be both useful and illustrative of several of the Apple III techniques we've discussed.

### Access III

Somewhere along the way, whoever created Access III, the Apple III terminal/communications package, left out something that a few people might consider mildly necessary. There is no way to take a captured file and print it out! That's right, once you've got the bloody thing in there, you can't see it! Not ever! Well, maybe if you have AppleWriter III you can, but it seems a shame to spend the money on that as well, if all you want to do is read the files you've captured.

Knowing how to program the III would, of course, be one way to solve the problem, but, let's face it, there aren't that many people who first bring home a new computer and a few programs, and know how. So, let's take a short walk through this program I wrote in Business Basic—a program that handles Access III file printing with a little panache.

### File Printing Program

```
10   HOME
100  VPOS = 5:HPOS = 1:PRINT"Where is
     the TEXT file you want to read?"
```

Now that we've cleared the screen, let's put something on it. VPOS is a vertical positioning command. Line 100 tells the computer to come down five lines from the top of the screen. HPOS indicates the horizontal position at which to start printing the message. Both these positions by the way, are relative to the top, bottom and sides of the screen. When you first turn the III on, the screen is 80 characters wide and 24 rows from top to bottom. This can be changed, but let's not get ahead of the program.

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```
135  VPOS = 7:HPOS = 1
140  IMAGE 15C
155  INVERSE
160  PRINT USING 140;"DISK 1";
165  NORMAL
167  IF FLAG = 1 THEN RETURN
170  PRINT USING"15C";"DISK 2";
```

So far, we know how to clear the screen, select a spot to begin printing, and print. But what about the artist in us all? What about putting a little here, a little there? That's where line 140 comes in! It creates an image in the "mind" of the computer consisting of 15 empty spaces to be filled. Not only that, but adding the C tells the III that no matter what we insert, it should be centered in the space. Had we used an R, the message would have been flush right; an A, flush left.

What happens, you say, if we try to put something longer than 15 characters in that slot? Well, the computer counts out the required number of spaces and throws everything else away.

Line 160 shows how to use the Image statement. We tell the computer to print using the image we created in line 140—in this case, the words "Disk 1". Line 170 illustrates another way to accomplish the same thing, only here we create the format we'll use on location, so to speak, rather than referring to something previously defined.

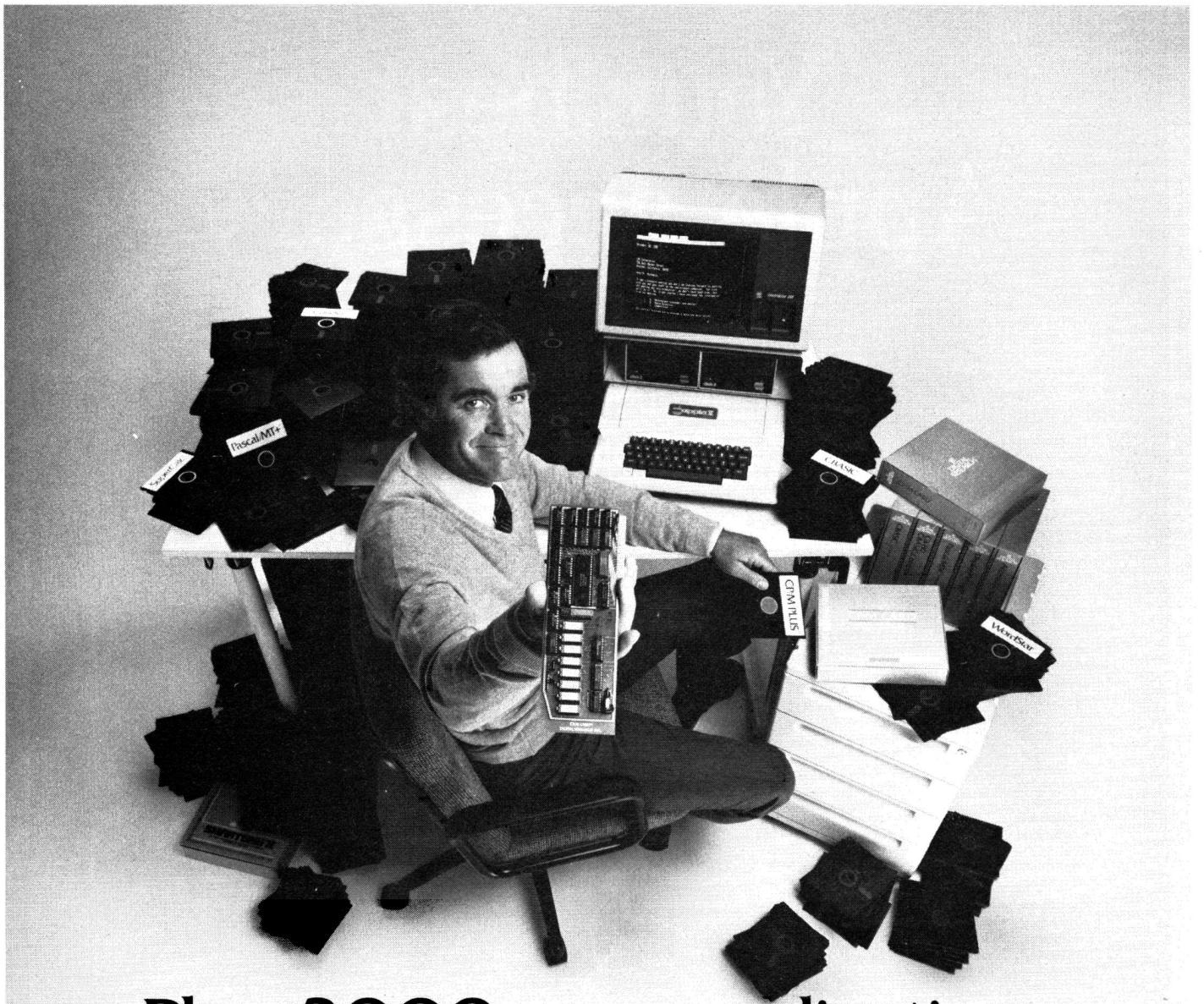
That's two ways of using Print Using. If I were you, I'd stop for a minute and try them out. They are a little different than the use of Print Using under most interpretations of Microsoft Basic. Don't worry, I won't go on until you get back.

How'd it go? Now that you've returned we'll continue on.

```
175  IF FLAG = 1 THEN RETURN
180  PRINT USING"15C"; "DISK 3";
185  IF FLAG = 1 THEN RETURN
190  PRINT USING"15C"; "DISK 4";
195  IF FLAG = 1 THEN RETURN
200  PRINT USING"15C";"PROFILE";
205  IF FLAG = 1 THEN RETURN
207  VPOS = 12:HPOS = 1:INVERSE:
     PRINT USING"79C";"USE THE AR
     ROW KEYS TO SELECT, THE
     RETURN KEY TO ACCEPT YOUR
     CHOICE":NORMAL
210  VPOS = 9:HPOS = 0:CHOICE = 1
215  GET A$:IF A$<>CHR$(8) AND A$<>
     CHR$(21) AND A$<>CHR$(13) THEN
     215
```

Line 215 contains one way to gather information into the computer. A Get command pauses and waits for a character to be typed at the keyboard. The subsequent If statement is a qualifier. If the key typed in response to the Get command does not have an ASCII value of 8 (the left arrow) and it doesn't have a value of 21 (the right arrow) and it isn't a carriage return (ASCII value 13), then we want the computer to go back and wait for another value. This continues until the character typed falls into the range we've selected. (Another way might be IF ASC(A$)<>8 AND ASC(A$)<>21 AND ASC(A$)<>13 THEN 215. They're two variations on the ASC and CHR$ functions we covered last month.)

```
220  IF A$ = CHR$(13) THEN 300
225  :
230  FLAG = 1
235  VPOS = 7:HPOS = ((CHOICE - 1)
     *15) + 1
240  ON CHOICE GOSUB 160, 170, 180,
     190, 200
245  IF A$ = CHR$(8) THEN DTRACT
     = -1:ELSE DTRACT = 1
```

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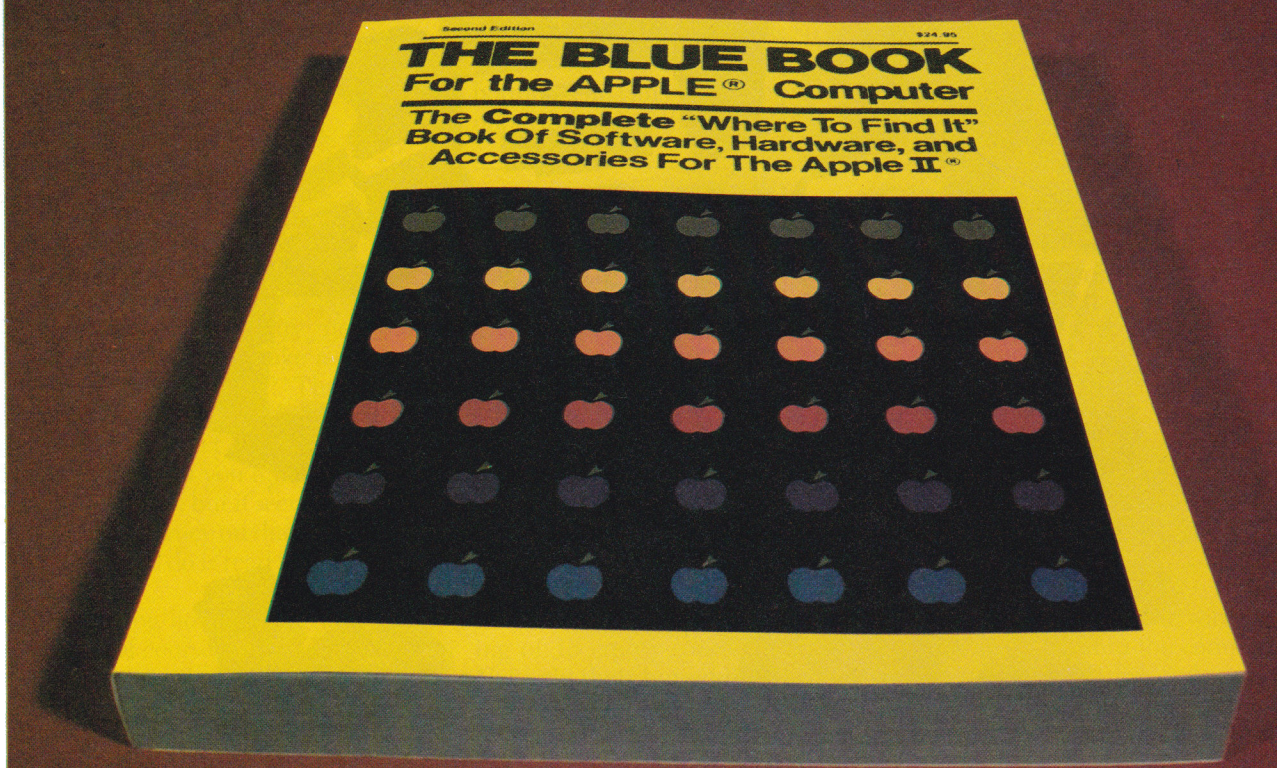


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```
250  CHOICE = CHOICE + DTRACT
255  IF CHOICE<1 THEN CHOICE = 5
260  IF CHOICE>5 THEN CHOICE = 1
264  VPOS = 7:HPOS = ((CHOICE - 1)*15)
     + 1
265  INVERSE:ON CHOICE GOSUB 160,
     170, 180, 190, 200:NORMAL.
```

Let's skip a bit and consider ON CHOICE GOSUB... in line 240. The general format is "ON val GOSUB lnum, lnum,..., lnum". (Don't get frightened, "val" is simply short for "value," and "lnum" is just a way of showing that there should be a "line number" inserted. This is the format you'll find in many of the manuals, so you're probably familiar with it.) Gosub is the command that tells the computer to take a break from a particular portion of the program and go to a subroutine (another set of instructions). Although it is possible to leave the computer in that subroutine, we usually, after having it execute, tell it to return to the main portion of the program.

What I am saying here is, depending on the value of the variable called CHOICE, the computer will go to one of the next five lines listed. For instance, if CHOICE = 1 the computer will jump up to line 160 and do whatever is specified there. Then, since the value of the variable FLAG is already set equal to 1 in line 230 (Basic initializes all variables as null when we type RUN), the computer sees the instruction in line 167 and returns. Notice that we've arranged it so the choice is never less than 1 and never greater than 5, the number of lines the program can possibly go to.

```
270  GOTO 215
300  ON ERR GOTO 9000
```

The command in line 300 is both a blessing and a curse. On Err is a very simple instruction used to tell the computer that if it finds a mistake in something that follows, it should react in a specific way. In this case, it should go to line 9000.

That's really a good function to have if you are writing programs for other people to use. Should they make a mistake (like entering a number where the program wants a letter, or vice versa), you can control what happens next, rather than having the III print one of its caustic error messages and possibly break out of the program. The curse that comes with this gem becomes apparent if *you* make a mistake in the instructions the On Err leads to. The machine will try to do what you've told it to, but finding an error there... Well, you get the picture.

### Prefixing Drivers

```
305  IF CHOICE = 1 THEN PREFIX$ =
     ".D1":ELSE IF CHOICE = 2 THEN
     PREFIX$ = ".D2":ELSE IF CHOICE
     = 3 THEN PREFIX$ = ".D3": ELSE
     IF CHOICE = 4 THEN PREFIX$ =
     ".D4": ELSE PREFIX$ = ".PROFILE"
310  OFF ERR
```

We've discussed PREFIX$ before, but I'd like to refresh your memory. (If anyone out there doesn't need a refresher, skip down about six paragraphs and the rest of us will meet you later on.) The Apple III, unlike many computers on the market, contains no permanent internal memory, except for a tiny amount that is in control when you turn the machine on.

The operating system is the group of instructions that is loaded into the machine and tells the machine what things it can do and where and how to do them. It contains a group of files called drivers. These drivers are specific operational routines for each device connected to the III. Some come already on the disk you use to start up the machine; others can be incorporated to match your own particular needs. Some drivers built into the operating system are for the disk drives. With one exception, these can't be changed.

The Apple III can have up to four 5¼-inch floppy disk drives connected to it, one of which is an internal drive and always connected. As far as the III is concerned, these drives have their own names. They are called, rightly enough, D1, D2, D3 and D4. One other type of storage device that can be connected to the Apple III is a hard disk—a non-removable storage medium that holds vast amounts of data compared to the floppy disk. Apple Computer's version of this hard disk system is dubbed Profile, and for all practical purposes, this is what the III calls it. Profile is the exception mentioned above to changing disk drive drivers. When you buy a Profile, you must add the driver for it onto the operating system.

Since Basic allows us to have variables named D1 or D2, and even PROFILE, the operating system must have some way to know that these drive names are not variables, but special messages the III must act on. Apple does this by giving these devices a first name. Not that it's much as first names go, but it does suffice to notify the system that we want to do something via one of the drivers. It's done by placing a period before the driver name, like .D1 or .PROFILE.

When we first turn on the Apple III, it knows about all of the floppy drives (and the hard disk, if we have added that driver) but it doesn't know if we have more than the internal drive physically connected. So, it takes the safest choice. It knows for *sure* the built-in .D1 is there, so it routes all the disk work through that drive.

Since no one wants to do excess work, and a computer is no exception, the Apple III takes the easiest way out to send data to the drive. Inside the operating system there is a variable called PREFIX$ that stores the name of the principle device we're working with. When we type LOAD or SAVE, the computer says "Oh, want to load something? Okay, LOAD PREFIX$/whatever." This cuts down on the work because the computer doesn't have to determine just what is connected and where the device is that we want.

If we have external drives attached (or, for that matter, a hard disk) we can tell the computer that the device to load from or save to is outside, so to speak, by adding the device name when we designate the name of the program or file we want. LOAD .D2 /MYFILE directs the machine to go

to the second disk drive and load the program called MYFILE. The / separates the device name from the program name so the Apple doesn't think we are trying to deal with a device called .D2MYFILE.

Notice that the device name precedes the program name. In the English language it's called adding a prefix. Hence the name of the variable. Just keep in mind the PREFIX$ is reserved solely for this purpose, and cannot be used as a variable in a program unless referring to a device.

### The Program Continues

Whew! Now back to line 310. OFF ERR is just the opposite of ON ERR. In fact, it turns the last On Err statement off—something that should be done as quickly as possible.

```
320 WINDOW 1, 13 TO 80, 24:FLAG = 0
```

No, we're not playing house. The Apple III has an adjustable screen display area. Remember when I mentioned VPOS and HPOS and said they were relative to the top, bottom and sides of the screen? VPOS and HPOS are what make them relative. What's printed at VPOS = 2 when the screen is at full size will not be printed in the same position if we've set the top of the display area 13 rows lower.

The adjustment command is WINDOW column,row TO column,row where the first "column,row" is where you want the upper left corner of the viewing screen, and the second "column,row" is the lower right corner. Line 320 sets up a new area, which begins at column 1 of row 13 and ends at column 80 of row 24 (the last row available)—an 80 by 12 display area.

```
400 VPOS = 2:HPOS = 1:INVERSE:PRINT
    USING"40R";"What is the name of your
    TEXT file?";:NORMAL:INPUT" ";
    PROGRAM$
405 ON ERR GOTO 9100
410 CREATE PROGRAM$, TEXT
415 DELETE PROGRAM$
420 OFF ERR
```

I'll touch on line 410 briefly, since I really don't want to get into file handling at this time. The Create statement does just that—it creates a space on the disk for a file. In this case, we are creating a text file (it could have been a data file). If the file already exists, an error is generated, and that's what we're checking for here.

If you've been following the development of the program this far, you know we've just asked for the name of the text file to be read. In trying to create the file, we'll find out if it actually exists where we think. If an error is generated, then we have the right file name and the right device, in which case we proceed to line 500. If not, if no error occurs, we delete the file just created, prompt that the information was incorrect and go back and try again.

```
425 HOME:VPOS = 5:HPOS = 1:PRINT"I
    can't seem to find that TEXT file. Press
    the SPACE bar to try again."
430 GET A$:IF A$<>"" THEN 430:ELSE
    HOME:GOTO 400
500 WINDOW 1,16 TO 80,24
510 HOME
515 VPOS = 2:HPOS = 1:PRINT"To what
    device would you like to print
    this?":PRINT
520 VPOS = 4:HPOS = 1
525 INVERSE
530 PRINT USING"15C";"SCREEN";
532 NORMAL
535 IF FLAG = 1 THEN RETURN
540 PRINT USING"15C";"PARALLEL";
545 IF FLAG = 1 THEN RETURN
550 PRINT USING"15C";"PRINTER";
555 IF FLAG = 1 THEN RETURN
560 PRINT USING"15C";"SILENTYPE";
565 IF FLAG = 1 THEN RETURN
570 CHOICE = 1:FLAG = 1
575 GET A$:IF A$<>CHR$(8) AND A$<>
    CHR$(21) AND A$<>CHR$(13) THEN
    575
577 IF A$ = CHR$(13) THEN 700
580 VPOS = 4:HPOS = ((CHOICE - 1)*15)
    + 1
585 ON CHOICE GOSUB 530,540,550,560
590 IF A$ = CHR$(8) THEN DTRACT =
    - 1:ELSE DTRACT = 1
595 CHOICE = CHOICE + DTRACT
600 IF CHOICE<1 THEN CHOICE = 4
605 IF CHOICE>4 THEN CHOICE = 1
610 VPOS = 4:HPOS = ((CHOICE - 1)*15)
    + 1
615 INVERSE:ON CHOICE GOSUB 530,
    540,550,560:NORMAL
620 GOTO 575
700 IF CHOICE = 1 THEN DESTINA
    TION$ = ".CONSOLE":ELSE IF
    CHOICE = 2 THEN DESTINATION$
    = ".PARALLEL":ELSE IF CHOICE =
    3 THEN DESTINATION$ = ".PRINT
    ER":ELSE DESTINATION$ = ".SI
    LENTYPE"
```

Most of what's done by these lines and the ones already discussed is similar. However, line 700 deserves notice. As the Apple III can use a device name to lighten its work load, so can you designate by name a channel for data to leave by using the variable DESTINATION$. We have defined it here at random, because it fits the desired purpose.

Just as the disk drives have assigned device names, so do all other devices connected to the III, including the screen. We call the screen .CONSOLE. (Remember, the period tells the Apple III we are talking about a device name.) Since a parallel interface card (and the appropriate driver) can be installed in the III, we've made provision for it and named the driver .PARALLEL. We're using the built-in RS232 serial output as .PRINTER, since the standard printer device driver that comes with the III uses that name. And, in case we have a Silentype printer, there's a device driver called .SILENTYPE.

Just to be confusing, these device names can be changed to anything we want. .PARALLEL could be called .CENTRONICS, or .PRINTER might be .QUME, just as long as we *always* refer to the device by that name. For clarity's sake I'm using names that best explain the functions of each device.

```
702 FLAG = 0
705 ON ERR GOTO 9200
710 OPEN#2,DESTINATION$
712 CLOSE#2
715 OFF ERR
```

Lines 705 through 715 provide a way of double checking that the device we have selected is really present. Since all the drivers are set up as files, we can access them as we

would any file. (Of course, it would be difficult to use one for input if it were an output-oriented device.) If it isn't there, an error occurs. If it is, we move on.

```
800 WINDOW 1,20 TO 80,24
805 HOME
810 VPOS = 2:HPOS = 1
815 INVERSE
820 HPOS = 0:PRINT USING"39C";"DO
    IT";
825 NORMAL
827 IF FLAG = 1 THEN RETURN
830 HPOS = 40:PRINT USING"39C";
    "CANCEL"
835 IF FLAG = 1 THEN RETURN
850 FLAG = 1:CHOICE = 1
855 GET A$:IF A$<>CHR$(8) AND
    A$<>CHR$(21) AND A$<>CHR$(13)
    THEN 855
860 IF A$ = CHR$(13) THEN 900
865 VPOS = 2:ON CHOICE GOSUB 820,
    830
870 IF A$ = CHR$(8) THEN DTRACT =
    - 1:ELSE DTRACT = 1
875 CHOICE = CHOICE + DTRACT
877 IF CHOICE<1 THEN CHOICE = 2
880 IF CHOICE>2 THEN CHOICE = 1
882 VPOS = 2:INVERSE:ON CHOICE
    GOSUB 820,830:NORMAL
885 GOTO 855
900 IF CHOICE = 2 THEN
    TEXT:HOME:GOTO 2000
905 TEXT:HOME:VPOS = 22:HPOS = 0:
    INVERSE:PRINT USING"79C";
    "PRESS ANY KEY TO HALT LIST
    ING":NORMAL
910 WINDOW 1,1 TO 79,21
1000 ON KBD GOTO 3000 1005 OPEN#1,
    PROGRAM$
1010 OPEN#2,DESTINATION$
1020 OUTPUT#2
```

Most of this is simple fare by now, but we should look at the group of lines beginning with 1000.

ON KBD functions much the same as GET, with one important difference. While GET pauses for a key to be pressed, ON KBD tells the machine to do whatever it is supposed to in the lines that follow, *but*, if a key is pressed, to stop and jump to a designated line number (in this case, line 3000).

Line 1005 opens the file we have selected (and assigned to the variable PROGRAM$), and line 1010 opens the output device. Line 1020 does something amazing. It tells the Apple III that anything we print from that point on should exit through the output device we have opened. Were we, at this point, to stop the program and tell the III to list, whatever device we have opened as DESTINATION$ in line 1010 will receive the listing. (If there is a driver for that device, but no actual device, the computer will lock up.) Prints and listings will be routed back to the default device (.CONSOLE) by typing CLOSE#2, to specifically close the destination device—or CLOSE to shut everything down.

```
1030 ON EOF#1 GOTO 2000
1040 INPUT#1:A$
```

Now we're into the easy stuff. ON EOF determines the status of the file we are reading. If we come to End Of File, the program jumps to line 2000. If we do not use ON EOF, and have no way of stopping the program when the last piece of data has been reached, we get an ?OUT OF DATA error message the next time we try to read the file.

Line 1040 is also important. In the main (a fancy way of saying 9 out of 10 times), we would use INPUT to read from a text file and READ to handle the contents of a data file.

```
1050 IF LEN(A$)<2 THEN 1070
1060 IF LEFT$(A$,1) = CHR$(10) THEN
     A$ = RIGHT$(A$,LEN(A$) - 1)
1070 PRINT A$
1075 IF DESTINATION$ = ".CONSOLE"
     THEN FOR TME = 1 TO 125:NEXT
     TME
```

What we have here are a format checking routine and a delay routine. If the program finds that the first character of the line we have just input calls for a line feed (CHR$(10)), we remove that character. Also, if we are printing to the screen, it is nice to slow the listing

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down to a semi-readable speed. So, line 1075 tells the Apple to wait a little, by counting from 1 to 125, and then continue.

```
1080 GOTO 1030
2000 CLOSE:GOTO 4000
3000 CLOSE#2:TEXT:VPOS = 22:HPOS =
     0:INVERSE:PRINT USING"79C";
     "CONTINUE. . .?":NORMAL
3005 GET B$:IF B$<>"Y" AND B$<>"N"
     AND B$<>"n" AND B$<>"y" THEN
     3005
3010 IF B$ = "N" OR B$ = "n" THEN 2000
3020 TEXT:VPOS = 22:HPOS = 0:IN
     VERSE:PRINT USING"79C";"PRESS
     ANY KEY TO HALT LISTING":
     NORMAL
3030 WINDOW 1,1 TO 79,21
3035 OPEN#2,DESTINATION$:OUTPUT
     #2
3040 ON KBD GOTO 3000
3050 RETURN
```

Lines 3000–3050 are the result of the On Kbd instruction above (line 1000). If a key is pressed anytime during the course of the printing, the program branches here, asks if we want to continue, and waits for the answer. The On Kbd is disabled when the key is pressed, so line 3040 resets it. Then the Return in line 3050 continues the program from where it was when the key was pressed. As you can see, On Kbd is a little like Gosub, except that instead of doing its death-defying jump from the On Kbd statement directly, as with Gosub, the program waits and jumps from wherever it happens to be when a keypress occurs. Like Gosub, Return sends us back to the point where the jump was launched.

Aside from juggling the screen parameters, an important command in line 3020 is TEXT. Again, some of you may have seen a similar command on Apple IIs. For the III, it resets the display area to the original 80 by 24.

```
4000 TEXT:VPOS = 22:HPOS = 0:IN
     VERSE:PRINT USING"79C"; "AN
     OTHER. . . .?":NORMAL
4005 GET A$:IF A$<>"Y" AND A$<>"N"
     AND A$<>"n" AND A$<>"y" THEN
     4005
4010 IF A$ = "N" OR A$ = "n" THEN
     TEXT:HOME:END
4020 RUN
9000 OFF ERR:HOME:VPOS = 12:HPOS
     = 1:PRINT USING"79C";"Tried to
     fool me, huh? You don't have that de
     vice! Press the SPACE bar."
9005 GET A$:IF A$<>"" THEN
     9005:ELSE RUN
9100 OFF ERR:GOTO 500
9200 OFF ERR:HOME:VPOS = 3:HPOS =
     1:PRINT"You don't have that device.
     You tell jokes for a living? Press the
     SPACE bar."
9210 GET A$:IF A$<>"" THEN 9210:
     ELSE GOTO 510
```

Lines 4000–4020 determine if we want to look at another file. Lines

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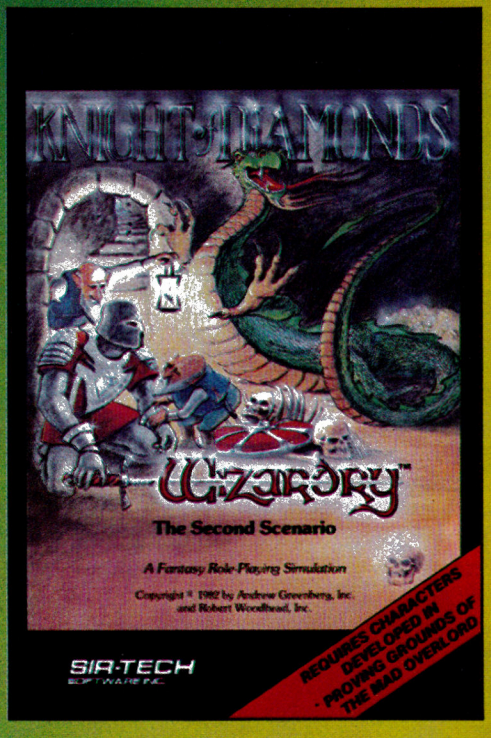
# Wizardry

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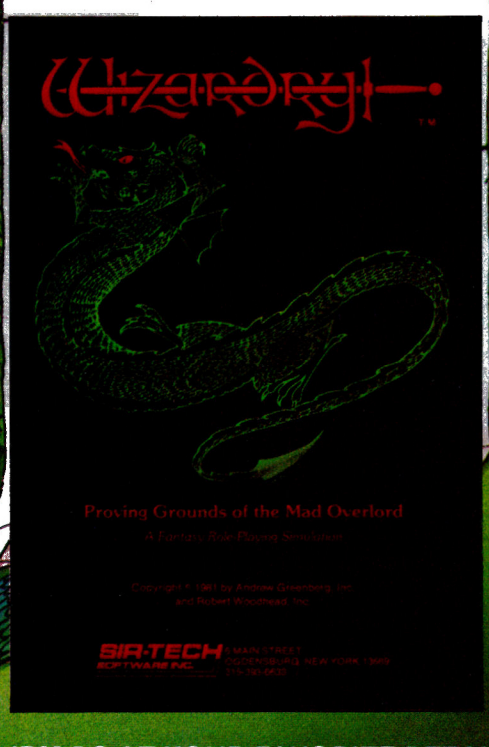


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**"Many an hour have I passed cancelling and rerunning a program..."**

9000–9210 are the error-checking routines.

Once you've responded to the query in line 4000, the screen clears and you're asked where the file is. Designate which device it's on using the left and right arrow keys, then press the return key to have the computer check if you actually have that device. Assuming you are correct, you're asked for the name of the file, and again the Apple III checks if you gave it the right name. Then it asks where you want the file contents to be printed. To respond use the arrow keys and the return key once again.

The computer jogs down the list of devices you have on file, and, if it finds the one you've selected, continues on. (If not, a small three-fingered hand emerges from the internal disk drive and slaps you on the wrist.) Finally, you must choose CANCEL or DO IT. If you cancel right then, or let the program run its course, you're asked if you'd like to read another file. Halt the listing at any time by pressing any key. I love On Kbd. Many an hour have I passed cancelling and rerunning a program, or just giving it erroneous data so I could be told off by the powers that beep.

That's the crux of the program. Like the Persians when they make their rugs, I've left room for improvement. By now you should be aces at making many of the changes that, a few short months ago, you'd never have thought possible (at least not from your very own fingertips).

## COMING ATTRACTIONS

Next month I'll tackle something that programs often lack—modularity.

There have been a bunch of times (that is, more than I can count on all fingers of both hands) when I've seen a program written for an Apple II, or (gasp, shudder) a Commodore, or even (here comes the lightning bolt!) a TRS-80, that I would have liked to put on my III. Usually these are good, solid, do-very-little, quick and dirty Basic programs nice to have around. But they're cluttered with CLSs, or Pokes and Peeks, or A$ = INKEY$s, which have equivalents on the III but are a real pain to dig out and replace.

The solution is to gather specialized, machine-specific code functions into subroutines that can be implanted or removed from programs. In Basic it's really not too difficult. We'll get into it next time around.

## APPLE III USER'S GROUP ON THE SOURCE

Now that I just told you about it, why should I go on, right? All seriousness aside, though, there is a nice group of people running a user's group on The Source telecommunications network. The basic requirements for joining are a modem and a terminal program for the III; and, of course, membership in The Source. Once those have been met, contact ST0823 via Source mail (or Smail, as it's known) for dues and access information. (Yes, dues. The unindicted co-conspirators responsible for the Apple III information are charged by The Source for the amount of room they take up, and the charge, although not much for a single unit of storage, adds up for a lot of space. Believe me, they have a lot of information there.)

## AFTERTHOUGHTS

It's March, the rains have stopped, hopefully the sun is shining where you are, and this is my third column for *inCider*. (Gee, I wish I could get the in inside the C like they do!)

Now is when you usually read somewhere in an article "this is your column..." Well, forget it. I'm the one who sits down 40 hours a month at the phone and typewriter unravelling the words that wind up here. It is, actually, my column.

However, it would be nice to know if what I write is what you want to read.

If you haven't already, relinquish the magazine (only temporarily, of course), jot down some thoughts and mail them in, either to me at my address or to *inCider* to my attention.

Because of the lead time needed for publication, you won't see a reply in these pages for a while. For a personal answer, enclose a SASE (self-addressed stamped envelope), but keep in mind that, like many of us, I work a 9 to 5 job (9AM to 5AM). I'll respond as soon as I can.

If you have a computer problem you can't get answered elsewhere, write to *inCider*. If you have a gripe with Apple, write in (there's a rumor they've assigned some marketing guy named Jobs the task of reading this column to find out what's happening). If you have a program you've written for the III, write in and share it. If you have no friends because you spend all of your time chained to the machine, write in for that, too.

And most of all, if you notice I've made a mistake, definitely write in. I know a lot of things, but not *everything*.

I'll see you here same time, same column in about 30 days. In the meantime, live long and program!

Ciao bene, AppleAmerica. ■

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# Book Reviews

**Apple II Assembly Language**
by Marvin L. De Jong
Blacksburg, VA:
Blacksburg Continuing Education Series, 1982.

This book is brimming with good intentions. In the introduction, De Jong states his desire that the reader have "fun" while "skipping the bothersome sections." On the other hand, he aims to teach the serious student to become a "competent assembly-language programmer" by writing lots of original programs and working carefully through all the experiments.

Small print on the inside covers notes the Blacksburg Continuing Education Series' orientation toward hardware experiments. But its title and introduction may lead the software-oriented Apple hobbyist, in pursuit of the particulars of 6502 programming and assembly-language concepts in general, to unknowingly pick up this book and be disappointed.

The author spends only half a page (p. 40) discussing analysis of problems, algorithms and program design. Only two pages are spent on coding subroutines to be called by Basic programs. The author doesn't discuss what assembly language is good for (controllers and high-speed data acquisition) until three-quarters through the book!

**"Most of the substantial programming examples are of the hardware cookbook variety."**

The book lacks a clear, up-front description of the target audience: their interests, prior knowledge, and what level of 6502 instruction they want, for which applications.

Most of the substantial programming examples are of the hardware cookbook variety: they will likely prove worthwhile to the reader with digital electronics experience at the beginning–intermediate level. The experiments, comprising about a third of the book, include Apple II operation of a tachometer, a printer interface, a Morse code device, and analog-to-digital and digital-to-analog converters.

De Jong, a physics professor, radioastronomer, and seasoned Apple user, sets out the experiments in a thorough, readable manner, instilling confidence that the procedures have been well tested. The 6502 circuit and Apple architecture, as well as the 6522 chip which figures in many of the interface experiments, are briefly described.

The account of the 6502 language is adequate as a reference manual but less than successful as a textbook. Aimed at the user with some programming experience, probably in Basic, description of the language is cursory and rambling, often making location of a particular piece of information difficult. For example, the subroutine is explained and illustrated on both pages 55–56 and 160–163; there is no cross-referencing.

The author frequently apologizes to the reader for inadequate explanations, citing lack of space and/or inability to communicate ideas at a sufficiently elementary level. In describing the purpose of flags (p. 49), De Jong reassures the presumably perplexed reader with, "Do not be disturbed if you do not completely understand these descriptions. They have been made as complete as possible so they will be valuable for your future reference." What "future reference," and why couldn't these descriptions be saved for the "future"?

Immersion of the reader in material which includes details elaborated upon only later in the text can be an effective educational method. However, the necessary ingredients—clear, consistent section divisions and specific cross-references—are in short supply here. Although there is an index and an unpaginated table of contents, this book's visually crowded, poorly subdivided appearance, as well as the lack of a glossary, sufficient cross-references and a reading list, make it an unsatisfactory tool for learning.

Other volumes in the valuable Continuing Education Series—*The 8080A Bugbook* comes to mind—demonstrate the feasibility of introducing hardware and software concepts in the same book. I wish that De Jong and the series' editors had structured this book more along *Bugbook* lines. As it stands, *Apple II Assembly Language* can serve as a valuable reference in the Apple user's library, but shouldn't by itself be expected to provide a sound introduction to 6502 software and hardware. ■

**Virginia Schaefer**
**Boston, MA**

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# Software Reviews

## Monster Mash

In this arcade-style game, monsters arise from a graveyard and try to escape. Your duty is to keep them from getting out. If ten monsters make it to the exit, the game is over.

To help you keep the creepy critters from leaving, you have a monster masher system consisting of three rows of four "mashers" that look like gravestones. There is a gate system that you use to force the monsters to travel in front of the mashers as they try to leave the graveyard. That's when you get to mash 'em. This is not as easy as it sounds because, as the game goes on, more and faster monsters appear.

The monsters include "Claws," a crablike creature fond of clacking his mandibles; "Smokey," a disembodied head that "pockety-pocks" along like a small John Deere tractor; and "eggs," which cause no harm if they escape. When mashed, eggs turn into snakes that must be mashed again. You'd better get the snake because if it gets out it is counted as three monsters.

A variety of masher control options increase your finesse. You can have all gates operating together or each column of gates operating independently, using keys 1 to 4. You may select all mashers operating together or each column of mashers operating independently, using keys 6 through 9. You may think this refinement unnecessary at first, but when you get above level 3, visitors begin to pass through the graveyard. You need the extra control over your masher system because the visitors aren't in any hurry to leave. They usually stop right under a masher to look around! If you mash a visitor, or let a monster grab him, the game is over.

Six levels of play match your skill. The higher the level, the faster the monsters move. Mashing monsters at higher levels gives you more points per monster. The all-time high score is kept on the game disk, while each session's scores are displayed after every game.

The monsters come in waves, with a pause after each wave. After several waves you are given the option of changing the level of play. I always hesitate to increase the level because, as the computer waits for my decision, three little orange pumpkins dance in the corner of the graveyard and seem to say, "Next time we're gonna getcha!"

The game has good graphics, animation and color, and fair sound. Its best feature is the wide variety of skill levels required to play the game. At the lowest level my eight-year-old daughter was able to run up a satisfying score on her third try. At the game's highest level, using independent gates and mashers, old Dad felt like a concert pianist on the keyboard. The action really gets hot and heavy. The reaction time and coordination required will challenge the most experienced arcade player.

Monster Mash is available from Software Farm, 3901 S. Elkhart, Aurora, CO 80014, for $29.95. ■

**Lee E. Sumner, Jr.**
**Dallastown, PA**

## Spy's Demise

Up to saving the world? If not, read no further. Only those with stalwart hearts and a quick hand will find entertainment here. No small warning, this. Bring together the puzzlement of a perplexing message and rather swift and deadly opponents, and you have Spy's Demise.

This arcade action game features a simple mission—merely scramble to the top of a building and, as a reward for your efforts, receive part of an encoded message that may well save the world. Sound easy? Though simple in concept, the game is far more difficult to master than many would care to admit.

Three options for game play are presented: You can use somewhat awkward left- and right-arrow keyboard approach, a regular joystick, or an Atari-style joystick with a Joyport or some such similar device to control a rather courageous little fellow. . . the spy.

Your spy finds himself at the start of the game standing on the lowest level of a 13 (gulp!) story building. Eight rooms, or eight sections, per floor must be traversed before the spy can climb to the next floor of the building. Each area is partitioned, so to speak, by the comings and goings of a guard. A total of seven guards, each in an elevator, patrol the building. The guards are hasty, quick to anger, and uncoordinated.

Ah, an advantage, you think! Well, unfortunately, that is not the case. You'll be hard pressed to predict the pace and position of each elevator. Time your spy's movements incorrectly, and the CIA reject can kiss retirement goodbye. And therein lies the object of the game: He must cross the eight rooms of each floor without running into, under, or above a speeding elevator, gain the next flight, and continue thusly until he can breathe the fresh air from high atop the building's roof.

But just because you succeed in one building doesn't mean the succeeding edifice will be any kinder to you. Oh, no. The second building is not quite as tall as the first building. Less footage to scramble through, you're thinking? True, but the number of guards in their speeding elevators remains the same—which means less space is patrolled, and your task is *more* difficult.

I forgot to mention that on each floor there are wee pieces of the puzzle to be found. Such items as a tape recorder, microfilm, perhaps a gun, or a dossier, lie about, just waiting to be picked up. Keep your eyes open,

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especially for the ring(s)! By merely passing through the object, your spy collects it, and your score is handsomely increased. Some players actually travel backwards, at great risk, to retrieve objects that appear after their spy has successfully maneuvered across a floor.

Restart the game by pressing control-R. If the game sounds vex you, use control-S to lessen an alleged annoyance. Escape pauses the game. The three highest scores to date are indicated on the game's title page, and are updated with the player's initials when a new score outdoes one of the previous ones.

A constant reminder of your score ticks away in the upper right corner of the screen. The faster your spy crosses each floor, the more points you'll find accrued. Should you manage to decode the message, Penguin Software has for you an official Spy's Demise T-shirt, one that could be worn with pride. These T-shirts will be awarded to the first successful code breaker from each state of the United States, each Canadian province, and each other country.

Spy's Demise is the latest of what I prefer to call the Elevator Entertainments, as I can't think of another label for a game that uses ascent and descent, without the use of ladders, as a key device. The game comes from Penguin Software, 830 4th Ave., Geneva, IL 60134. It costs $29.95. You'll enjoy playing Spy's Demise, or die in the attempt. ■

**Hartley G. Lesser**
***inCider* staff**

## The Blade of Blackpoole

Here you are, the intrepid adventurer wending your way through the forest in search of the magical sword, Myraglyn. Anticipating trouble, you are prepared to meet and defeat all obstacles in your path. What ho! Ahead looms a large and menacing carnivorous plant: Your progress is blocked until you either appease or slay it. Nothing in your inventory is acceptable and the weapons you possess are useless against it.

Think back on where you have been and what you have seen. What could the plant desire? Well. . . perhaps it wouldn't hurt to take another look around the area you just left. Maybe you missed something. Could it want—no that's ridiculous. What have you failed to find? As each attempt fails to win your safe passage, you realize this will not be easy.

The object of this well conceived and executed game is to find and return the sword. Myraglyn has been stolen from its place of honor upon the altar of an unspecified (and presumably local) religion. Rumor has it that Myraglyn lies hidden within a secret chamber somewhere near Blackpoole. As you venture out to recover the sword, beware: Blackpoole is located in a region of the universe infested with monsters, carnivorous plants and magic. Most seem to exist solely to prevent you from completing your task, as though they were in league with the dastardly villains responsible for the theft. Everywhere you turn, they seem to be trying to stay you from your journey (and they do an admirable job of it). Nor will you find much help from the denizens of the Blackpoole area. Even those who could aid you in your search will do so only after you have fulfilled *their* demands.

The game boots up with a nicely rendered introduction and a message telling you to insert a copy of the backside of the disk. If you read the accompanying instructions (you *do* always read the instructions before booting a new disk, don't you?), you'll know how to make this copy using the Copy or CopyA program on your 3.3 DOS System Master.

This is a nice, thoughtful touch. No more worry about bombing your only copy of the game disk! Now if the kids decide to play Frisbee with your disk or you accidentally spill your coffee, all is not lost. You will need the master disk only for the initial boot before each game session. Once past the introduction screen you will use the backside copy for all further play.

Another nice feature of the game is that, after loading from the original disk, it will automatically conduct a quick test of itself and your Apple to

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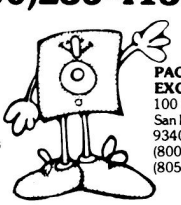

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assure the game has loaded properly.

If so, the program dumps you into the midst of a forest, with the usual ho-hum hi-res graphics we have come to expect from this genre of graphics/text adventures. You possess only a moneybelt and some gold coins. As you wander through the forest getting the lie of the land (a map is strongly recommended), your attention will be drawn to objects which may (or may not) be of benefit on your quest.

A warning here! Stay alert—you won't always be told which objects may be helpful and needed. (Nobody said this was going to be easy.) I found myself wondering on occasion whether even the programmer was in cahoots with the thieves who stole Myraglyn.

Your inventory is limited to six items. In just the first few moves of the game you will find many more than six objects that would be handy while exploring strange and hostile territory. Choose well, it's a long way back.

The program lets you string commands together to accomplish multiple moves and actions with a single command. For example, you could instruct it to "go west and drop the money then go north." While the program handles full sentences quite well, I found it easier to use the usual form of adventure type commands (e.g., Get lamp, w, swim n, etc.). Old habits die hard.

A minor beef about the program at this point. When you enter a scene with an object that the program wishes to call to your attention, you must hit a key to have the object identified. (You will know something of interest is there because the last line of the text description reads >MORE<. Don't let this none-too-subtle approach make you careless: Not all the items found will be useful and not all useful items will be so blatantly introduced.)

This plays havoc with your well-planned progression of moves all nicely strung together. The program will interpret the next command in the command string as a key press, and display the identity of the object.

**"All of the puzzles encountered have logical solutions..."**

Having fumbled the previous instruction (mistaking it for a keyboard input), the program will greet subsequent commands with a series of "you can't go that way" responses.

I was pleased to discover the program recognized a large number of words, and it wasn't necessary to phrase each instruction in precise terms. Often, if the program did not fully understand, it would prompt me for more information or clarification. Sentence syntax needs to be fairly precise, and this is explained in the instructions. I found that merely rephrasing a command would often produce the desired results. I occasionally got completely inappropriate responses to commands, but, all things considered, the game recognizes a comfortable variety of words and sentences.

All of the puzzles encountered have logical solutions, though as with most good adventure games the answers appear much more logical in retrospect. You can call up a help feature by typing HELP or HINT, but you probably won't be overwhelmed with assistance.

Should you be careless enough to get yourself killed, the game will end by showing your score and asking if you would like to start a new game. Scoring is displayed as a fraction of 500, a perfect score being 500/500. If you want to try again (and you will) the program will politely reboot itself (still on your copied disk) and you'll find yourself back in the fray. Provision exists for saving up to ten stages of play, and my advice is to save often.

If you consider the price of The Blade of Blackpoole ($39.95) in relation to the many enjoyable (sometimes frustrating) hours spent playing, you may well find it one of the better buys in your collection. It's available from Sirius Software Inc., 10364 Rockingham Drive, Sacramento, CA 95827. ■

**Richard Brown**
**Oakland, CA**

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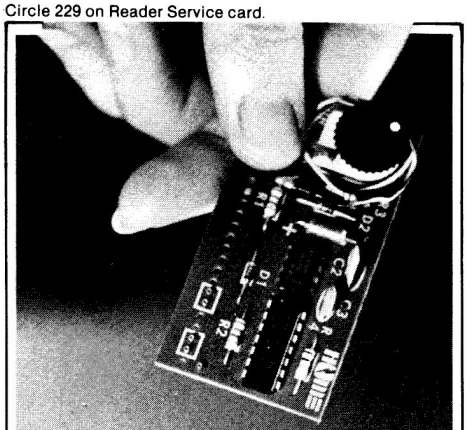

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# New Software

**edited by Linda Stephenson**

### Ice Demons

Trusty bow in hand, you make your way across the icy battlefield. Before you loom the ice pits: jagged holes that spew forth grotesque nightmarish creatures. Ice Demons is an arcade-style action game that ranges across a clear ice plain. Mindless blasting won't make it—this game requires strategy too. Ice Demons, from Morningstar, 39 Florence St., San Francisco, CA 94133, costs $29.95. Reader Service number 416.

### Night Falls

Hordes of aliens attack every night, trying to destroy your city. As commander of the Emerald Cityscape, how many nights can you survive? Pick up a copy of Night Falls for $29.95 and find out—nine levels of play from beginner to impossible. You'll need paddles or a joystick.

Omega Microware Inc., 222 South Riverside Plaza, Chicago, IL 60606. Reader Service number 415.

### Flip Out

If you enjoyed the simple elegance of the mechanical marble game, you'll flip over this electronic update. Flip Out, from Sirius Software Inc., 10364 Rockingham Drive, Sacramento CA 95827, allots ten "marbles" to each player. Every marble "dropped" causes a chain reaction, the outcome of which can be predicted from previous outcomes. Your goal is to get all your marbles to fall through a series of traps and out the bottom before your opponent does. For sheer unabashed frippery, you can't beat Flip Out; $29.95. Reader Service number 414.

### Electronic Gradebook

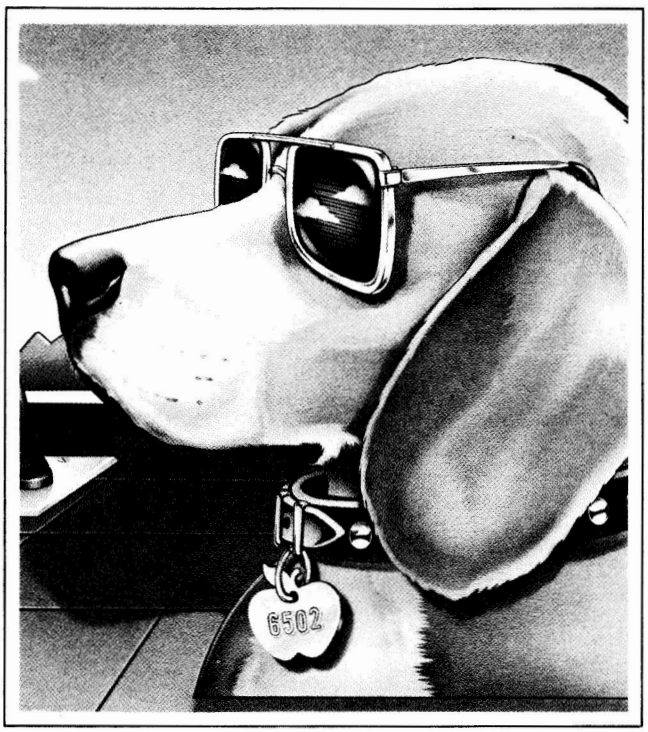
The ECS Computerized Gradebook assists classroom teachers with the tedious process of assigning grades. It stores 50 student names, with up to 10 scores per student. The program will translate raw scores into standard scores, weight scores by percentage, compute total weighted scores and assign letter grades. It costs $49.95.

Electronic Courseware Systems Inc., PO Box 2374, Station A, Champaign, IL 61820. Reader Service number 413.

### Playing Doctor

Encourage your kids to experiment and learn by doing. Or buy them The Doctor Game and let them loose on the Apple. This medical simulation package leads the player/doctor through the necessary physical examination, lab tests, X-rays and other diagnostic procedures. In the Surgical mode, the "doctor" selects appropriate anaesthesia. In the Treatment phase, he/she selects the cure from a multiple-choice menu.

This high-resolution game features sound effects and a surprise animation reward if treatment is successful. A full tutorial on the use of lab testing facilities comes with the disk; a glossary of terms is also supplied. The Doctor Game is from Simulation Software Co., 6035 N. Maplewood Ave., Chicago, IL 60659. It costs $20. Reader Service number 401.




*Sophie, Bert's friend.*

### Sophie's Choice

Five new packages are offered by Beagle Bros. Micro Software, 4315 Sierra Vista, San Diego, CA 92103. Like previous Beagle disks, all are unlocked.

ProntoDOS is a triple-speed Apple DOS update that frees up an extra 15 sectors of disk space. You can update program disks by booting ProntoDOS and using the normal INIT command. ProntoDOS is compatible with all DOS commands and performs normally with most programs. At $29.50, it's no sleeper.

Frame-Up is a nifty graphics presentation utility. It includes a display module that lets you send entire Apple presentations on disk to your associates or home to Mom. It costs $29.50.

Flex Text, a machine-language utility, lets you create high-resolution text screen layouts of normal, expanded and compressed characters, using Applesoft commands. Price is $29.50.

The Beagle Bag contains 12 of Bert Kersey's Apple games and a Beagle Menu greeting program that produces a text screen printout of your normal disk catalogs, 20 file names at a time. You can use this special catalog utility to display only the file names you want—such as all Applesoft files or all locked files. This chock-full disk costs $29.50.

Typefaces arrives, by popular demand, as a companion disk to Apple Me-

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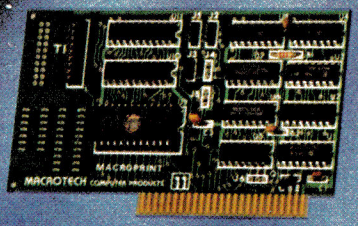

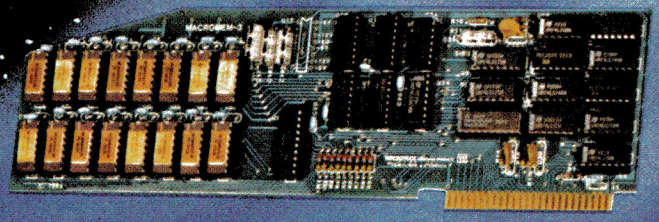

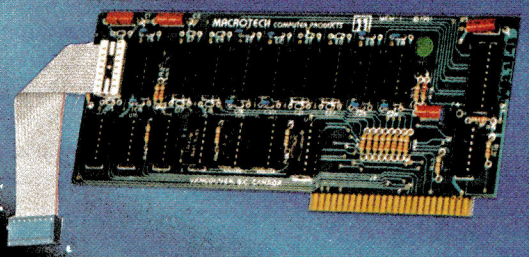

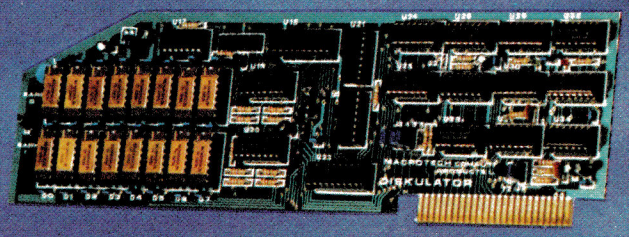

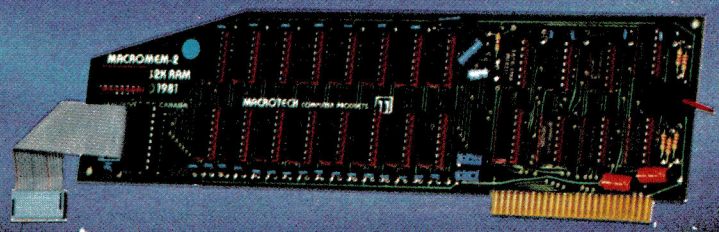

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**32k - $299. 64k - $399. 128k - $499.**

## 32K — MACROMEM-2

Cost effective for VisiCalc. Users will find this board a must together with VC-EXPAND and VC-EXPAND/80 (*5) - virtually DOUBLES the usable array size. Supplied with MACRODISK and other software to free ram memory.

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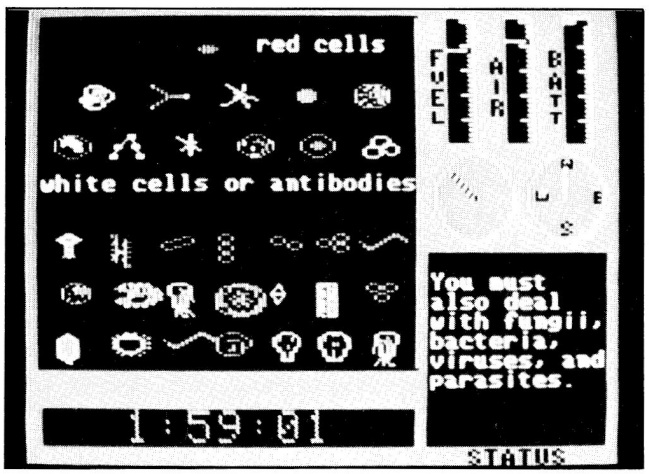


*Journey through inner space with Synergistic Software's Anatomical Adventure.*

chanic's Xtyper and Hi-Writer programs. Bert Kersey reportedly sat up for 255 nights straight (???) creating fonts for this disk. It provides 26 shape-fonts and the Beagle Menu, all for $20. Reader Service number 407.

### Invasive Adventure

Fantasy adventure, arcade action and medical science combine in Microbe: The Anatomical Adventure. The game follows a miniature submarine injected into the patient's body. The sub Microbe's mission is to find and rid the body of disease, and to repair damage to the brain. If corrective surgery is necessary, the crew of the Microbe must perform it. The crew's captain, navigator, technician and physician each have specific job functions. If any crew member is disabled during the game, the mission is endangered.

As the game progresses, players must keep track of damage to the sub, the fuel and air supplies, the compass and sonar readings, and the status of the laser (used to zap the germs). Players must plan their strategies carefully on their fantastic voyage.

The game's three levels are designed for fun or for health education. On the third level, players must know what drugs to prescribe and what immunity levels, blood pressure, heart rates, etc. are healthy or dangerous. Microbe: The Anatomical Adventure is available from Synergistic Software, 830 N. Riverside Drive, Suite 201, Renton, WA 98055. It is priced to sell at $44.95. Reader Service number 412.

### Micro Mother Goose

It may be time to make room for an Apple in the nursery, and Software Productions offers the software to persuade you. Three games and nine animated comics combine to entertain kids from 3–9 years old. The games start slow and easy, then accelerate to maintain the challenge. Operation is simple: Only the space bar, return key and a game paddle or joystick are required. No reading is necessary.

The Micro Mother Goose package includes a program disk (easily copied for backup), six colorful Mother Goose stickers, a "Micro Do's and Don'ts" poster, a 16-page parents' and teachers' manual, and a fan club and registration card.

The package costs $39.95, from Software Productions Inc., 2357 Southway Drive, Box 21341, Columbus, OH 43221. Reader Service number 411.

### The Graphic Solution

TGS is a sophisticated graphics editor and animation system for combining graphics and text, using simple keyboard commands. Features include powerful editing capabilities, such as draw/erase/expand/contract lines, boxes, circles, shapes, characters and numbers, activated with a single keystroke. You can see your work in magnified detail for fast, accurate editing. Multiple backgrounds, multiple objects and variable speed animation let you handle difficult animation jobs. Hidden-line animation shows the proper overlay of objects when one object crosses another; you can remove the hidden lines of your 3-D graphs. Text is added to your film automatically from the keyboard when using the special TGS character set. You can also create your own fonts for special effects or use supplied characters.

TGS: The Graphic Solution is available from Accent Software Inc., 3750 Wright Place, Palo Alto, CA 94306. Reader Service number 410.

### CP/M DBM

A file management system called SuperData-File Manager is among the newest members of Sorcim's SuperWare family. SuperDate operates through fields, records and files. A "field" is any unique piece of information; in an employee's dossier, for instance, the information following "Name" would be one field. A "record" is defined as a collection of related fields, and a "file" as a collection of records. Thus information on accounts payable could be filed, sorted and gathered by date due, amount, net-pay interval, or whatever. All files can be password-protected.

SuperData operates in a CP/M environment. It's from Sorcim Corp., 2310 Lundy Ave., San Jose, CA 95131, and costs $245. Reader Service number 409.

### Full-Service Software

An enhancement utility for the Apple Writer word processor promises to dress up your text. UPAPPLE adds backspace, word and character underscore, word and character overstrike, text-embedded printer control and format commands to the Apple Writer. Twelve characters not previously available from the keyboard are accessible with UPAPPLE, and the

enhancement also accommodates a lowercase adapter. Price is $29.95, from Single Source Solution.

The company is also offering a broad range of new software for the Apple. For more information or a free catalog, write to Single Source Solution, PO Box 578, Concord, CA 94522. Reader Service number 408.

### Sound and Nonsense

Grapple is the third in a series of arcade games written in GraFORTH. Fast action tests your speed and cunning in quelling an intergalactic jailbreak. You must stop the Horrible Hoppers, Sneaky Snerds and Flippant Flyers before they can escape to once again plague the universe. Price is $29.95; from Insoft Inc., 10175 SW Barbur Blvd., #202B, Portland, OR 97219. Reader Service number 404.

### Bells & Whistles

The Pinball Construction Set, by Bill Budge, will enable a home computer owner to construct, personalize and play his own video pinball games. No programming knowledge is required to play with this new toy—you don't even have to type commands. All phases can be directly controlled just as if you were hand-building a pinball game.

For information contact BudgeCo, Ellen Beritzhoff, 428 Pala Ave., Piedmont, CA 94611. The Pinball Construction Set costs $39.95. Reader Service number 406.

### Subterranean Adventures

Beneath the Palace of Anson Argyris, on the Planet Olympus, lies the last fortress to withstand the onslaught of the Loren forces —The Caves of Olympus. Protected by a robotic overseer, the fortress, with its miles of corridors, false chambers, death traps, one-way doors and matter-transport devices, is impregnable to all but one.

You can penetrate The Caves of Olympus by plunking down $39.95 and metamorphosing into a Vario 500 egg-shaped robot. The Caves of Olympus comes from Howard W. Sams & Co. Inc., 4300 W. 62nd St., PO Box 7092, Indianapolis, IN 46206. Reader Service number 402.

### Mansion Maze

The Crystal Caverns are hidden beneath an old mansion. Graphics and sound effects set the scene. Your goal is to find as many treasures as possible and secure them while searching through dark and dangerous passages. You must create your own map as you go. The mansion's many dark and dusty rooms are filled with clues and dangers. A player may suddenly fall off a cliff or become trapped in a clammy dungeon—with no way out.

Available from Hayden Software Company, 600 Suffolk St., Lowell, MA 01853; price is $34.95. Reader Service number 403.

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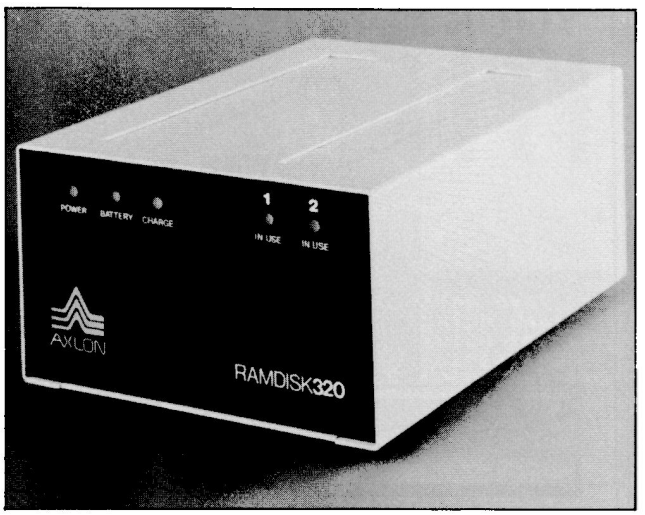
# New Products

**edited by Linda Stephenson**




*Axlon's RAMDISK 320K Memory System is now compatible with CP/M.*

### RAMDISK Enhancement

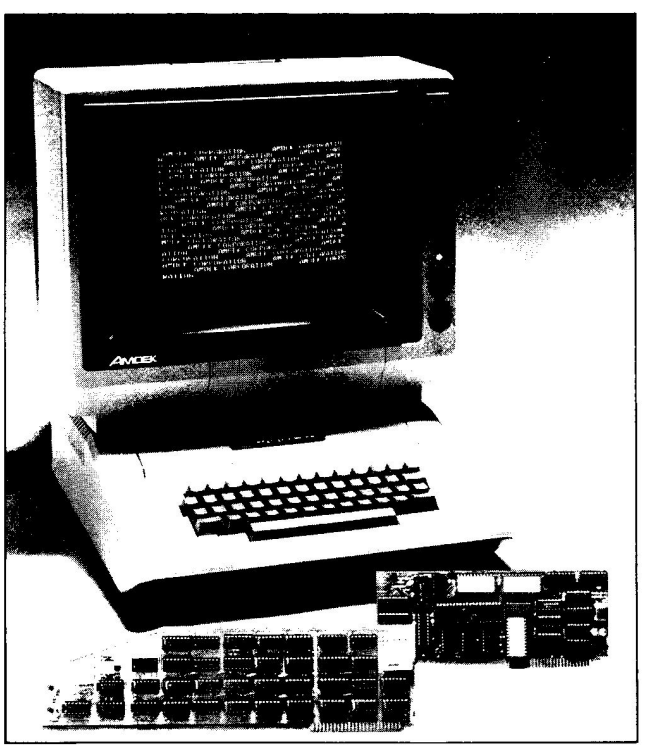
The RAMDISK 320K Memory System from Axlon Inc., 170 N. Wolfe Road, Sunnyvale, CA 94086, now includes CP/M compatibility. It will work with any Z-80 card, as well as with any other memory cards for RAMDISK systems. Under CP/M the system can be configured one of three different ways: to look like two 35-track drives, fully expandable to two 40-track drives, or one 80-track drive. Price is $1395. Reader Service number 418.

### DVM Board

Amdek's new Digital Video Multiplexor Board lets you use your Apple II with an analog or digital RGB color monitor. The board is software color-channel programmable, permitting computer control of the RGB inputs and providing 80 × 24 text display when interfaced with popular 80-column boards. Analog monitor applications require a "personality board" interface.

Four computer-controlled, multiplexed video channels are provided: Apple 40 character-line text, Apple low-resolution color graphics, Apple high-resolution color graphics and 80 character-line text from a vendor board. Two additional high-resolution modes—all-white and three-color with pure white—are offered. The color intensity is software programmable. Price of the DVM-II is $199.

Amdek Corp., Marketing Dept., 2201 Lively Blvd., Elk Grove Village, IL 60007. Reader Service number 420.




*DVM-II from Amdek, for high-resolution color and text with analog or digital RGB monitors.*

### Programmable Printer

The GP-250X graphics printer offers special features to make your printouts perfect. Memory is set aside for you to define 64 of your own characters or symbols. Up to four unique print sequences can be stored in the printer's memory. Both serial and parallel interfaces are standard. You can tailor print format to your specifications. The GP-250X is priced at $499.

Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340. Reader Service number 419.

### Software Pollution Control

Electrical pollution drives computer programs crazy! Power line electrical noise, hash and spikes often cause erratic computer operation. And severe spikes from lightning or heavy machinery can damage expensive hardware. Even peripherals can create enough interference to disrupt your program. What to do?

The Magnum Isolator, from Electronic Specialists Inc., 171 South Main St., PO Box 389, Natick, MA 01760, will control severe electrical pollution. This surge suppressor features four individually quad-Pi filtered ac sockets. It will control pollution for an 1875 W load. Magnum Isolator costs $200.95. Reader Service number 423.

### Apple III Interfaces

A range of interface cards for the Apple III are available. The cards include an 8 channel 12 bit A/D converter with parallel I/O and timer, a BCD interface, a single port serial interface card and an 8 port serial interface card. The serial interface cards will extend communications applications—for example, a printer and modem could be used together.

For information, contact U-Microcomputers

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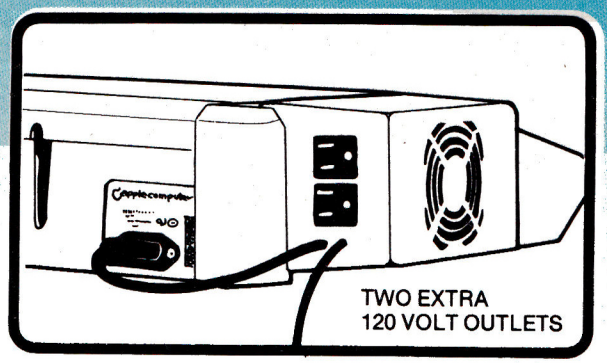


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*Apple-Cillin II is the comprehensive diagnostic system developed by XPS to check the performance of your Apple II computer system. Apple-Cillin II contains 21 menu driven utilities including tests for RAM memory, ROM memory, Language Cards, Memory Cards, DISK system, Drive Speed, Keyboard, Printer, CPU, Peripherals, Tape Ports, Monitors and more. These tests will thoroughly test the operation of your Apple, and either identify a specific problem area or give your system a clean bill of health. You can even log the test results to your printer for a permanent record.*

*Apple-Cillin II works with any 48K Apple system equipped with one or more disk drives.*

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*Apple-Cillin II: $49.95. PA residents add 6% State Sales Tax.*

XPS

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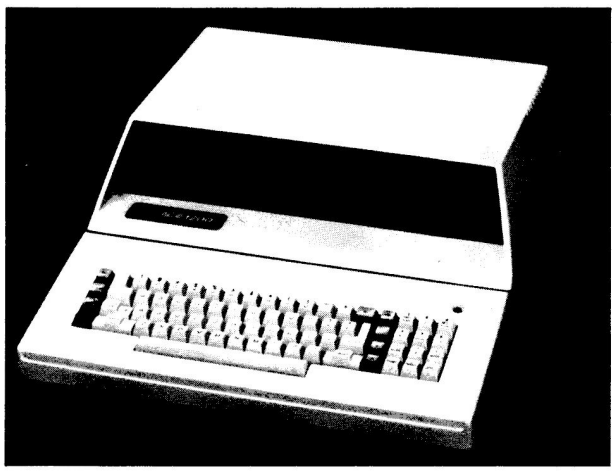


*Franklin Ace 1200 Professional, compatible with the Apple II.*

Inc., 300 Broad St., Stamford, CT 06901. Reader Service number 421.

### A Professional Franklin

The Ace 1200, from Franklin Computer Corp., 7030 Colonial Highway, Pennsauken, NJ 08109, features 128K of RAM, 80-column text, CP/M, upper/lowercase and a serial/parallel interface. This Apple II-compatible computer has a 72-key keyboard and a built-in fan and power supply. It includes a joystick/game paddle connector and a speaker. The Franklin Ace 1200 with one disk drive costs $2495. Reader Service number 422.

### Porta-Floppy

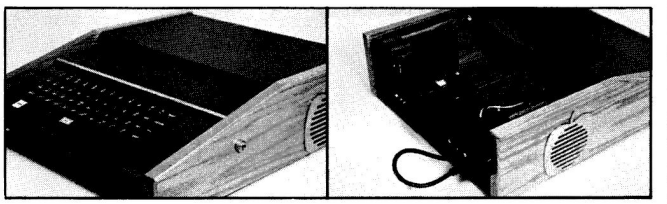
A 3½-inch microfloppy disk drive has been introduced by Shugart Associates, 475 Oakmead Parkway, Sunnyvale, CA 94086. Standing just 1.6 inches high and occupying about one-fourth the volume of a standard drive, the single-sided SA300 is suitable for portable applications where high capacity and small size are important. The drive is compatible with standard drives and can be incorporated into current systems with minimal adjustment.

The SA300 was designed to operate with a disk protected by a hard plastic shell; the shutter covering the data access window is spring loaded and remains closed until the disk is inserted. This design protects your data from dust and dirt.

The Shugart SA300 will cost under $200 in high-volume quantities. For more information, contact the manufacturer. Reader Service number 424.

### Classy Cover-up

The Byte Box dresses up your Apple II while providing full protection. Its unique locking keyboard cover will keep your program safe if you have to leave your computer briefly while working. Its built-in cooling fan and line-surge suppressor pamper your Apple, and plug-ins for your CRT and printer are easily accessible. The Byte Box is available in a



*Kel Tech's Byte Box protects your Apple in style.*

variety of hand-rubbed natural woods, and in colorful plastic laminates. It's an open and shut case! Price is $289, plus $15 for walnut and $20 for teak.

Kel Tech, 34732 Calle Fortuna, Capistrano Beach, CA 92624. Reader Service number 425.

### Storefront Apple

The Advanced Business Technology Retail Manager is integrated with the ABT BarWand, CashBox and other accessories to provide the small-business owner with automated retail management. Cash control is fast and accurate. Daily, monthly and yearly management reports are produced in minutes. The system generates bar-coded labels for all inventory items to simplify selling; inventory is automatically tracked. The system also records cash, check and celluloid sales, sales tax and credit memos. The system, including the Apple II computer, is priced under $6000.

Advanced Business Technology Inc., 12333 Saratoga-Sunnyvale Road, Saratoga, CA 95070. Reader Service number 427.

### Digital Sync

Syntauri Corp. discloses two developments for the alphaSyntauri synthesizer system: sync to tape and drum interfacing capabilities. These have been incorporated into Syntauri's 16-track digital recording system, Metatrak II, to give musicians the accurate, reproducible timing and instrument synching they need on stage and in the studio.

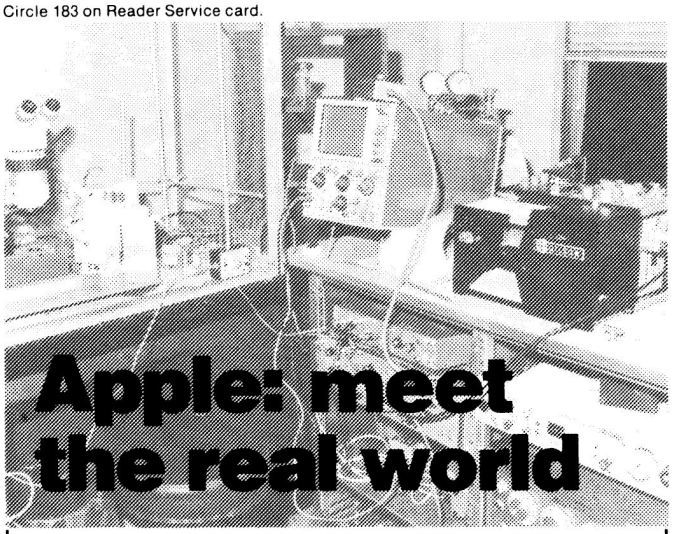
Metatrak II software is an upgrade to the alpha-Syntauri instrument. It also features oscillator performance mode and simultrak recording. The alpha-Syntauri line includes a four-octave keyboard priced under $800 and a Composer's Workstation (complete synthesizer and musical notation software) priced under $2100. The Apple II computer system is extra.

Syntauri Corp., 3506 Waverley St., Palo Alto, CA 94306. Reader Service number 426.

### On Guard!

A peripheral that turns your Apple into a home security system is available from Lehigh Valley Computer Corp., 523 South Clewell St., Bethlehem, PA 18015. The Eye features an on-board real-time clock and BSR remote controller; accommodation of unlimited detection devices; easily tailored software for customizing your system; and instructions for simple installation. The Eye uses inexpensive mag-

Circle 183 on Reader Service card.

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(2 channels, .39% Acc., 10 Volts full scale)

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*ALIS systems require a 48K Apple, Applesoft, DOS 3.2 or 3.3*

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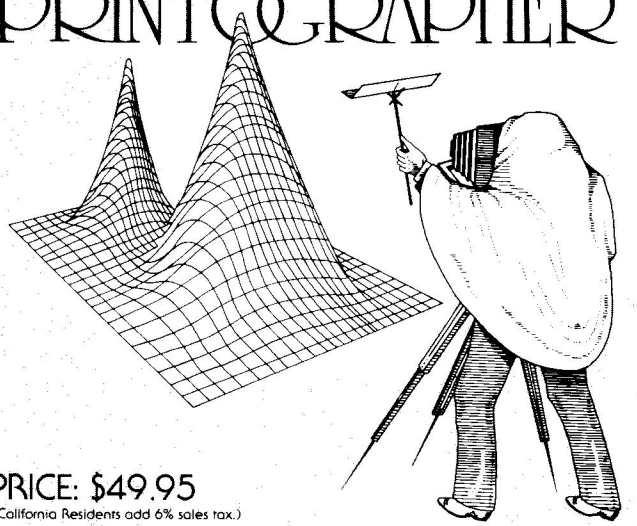

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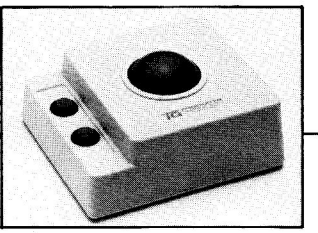

*Track Ball, from TG Products.*

netic switches to signal the microprocessor if a break-in occurs. If a break-in is detected, the system will turn on certain lights, sound an alarm or trigger a phone dialer to call the police. Cost is $199. Reader Service number 428.

### The Ultimate Cover-up

If you use your Apple in a Combat Zone, the Security Workstation is for you. This flip-top computer stand is fitted with a lockable cover that can be removed when your Apple is in use. The manufacturer designed the workstation for schools and other dangerous places, to protect computers from tampering, vandalism and unauthorized modifications.

For information, contact The Maine Manufacturing Company, PO Box 408, Nashua, NH 03061. Reader Service number 430.

### Paddle Ball

The spherical approach to game control adds new dimensions to play. Track Ball, an omnidirectional guidance system, adds quicker response to games requiring a lot of movement commands. It has a lower control-to-movement ratio than joysticks, and allows more sensitive positioning for graphics work on the screen. Fire control buttons are recessed below the ball control plane for unobstructed movement. Track Ball costs $64.95.

TG Products, 1104 Summit Ave., Suite 110, Plano, TX 75075. Reader Service number 429.

*The Security Workstation.*

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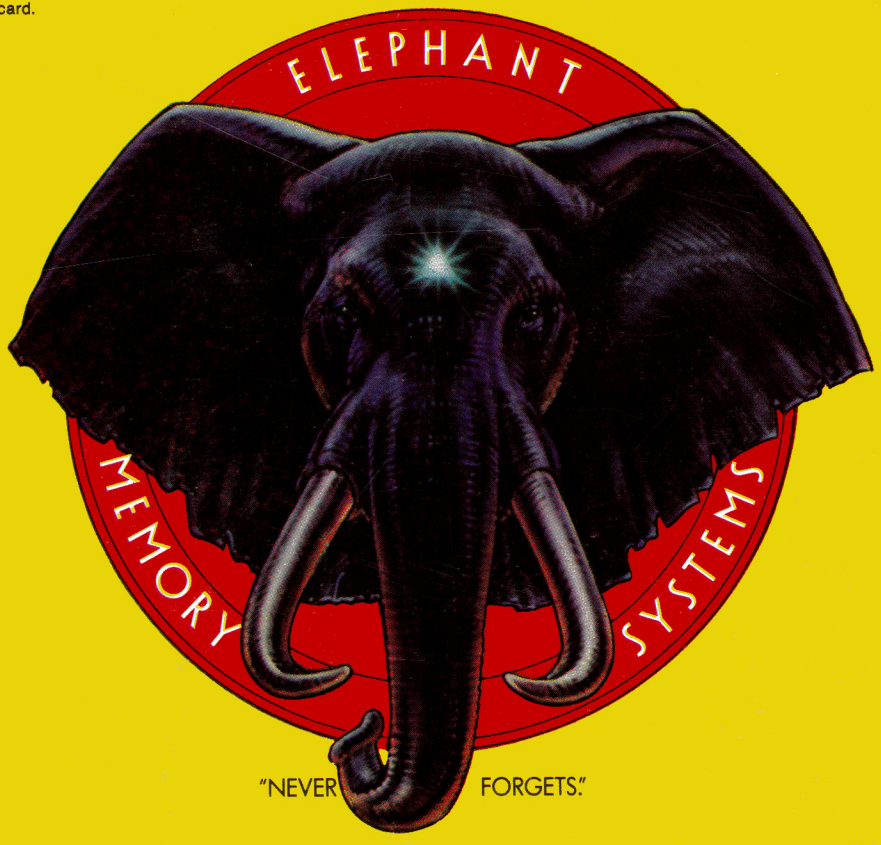
# REMEMBER:

Circle 3 on Reader Service card.

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Specifically, subcommittee X3B8 of the American National Standards Institute (ANSI) says so. The fact is all Elephant™ floppies meet or exceed the specs required to meet or exceed all their standards.

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